

2. There has not yet been a definite identification of any alkaloid in the Meliaceae.<sup>1</sup>
3. Both *Flindersia* and *Chloroxylon* contain coumarins, as do several other genera of the Rutaceae and several other angiosperm families, but not the Meliaceae.
4. Five species of *Flindersia* have been found to contain the flavanone glycoside hesperidin, which, Price points out, is ". . . . . a characteristic metabolite of *Citrus* species, also reported from *Zanthoxylum* but not, I think, from outside the family."

Thus it seems that the bulk of evidence available at the present supports the position of *Flindersia* and *Chloroxylon* in the Rutaceae.

I was able to collect and study three of the New Guinean species of *Flindersia* while with the Australian Commonwealth Scientific and Industrial Research Organization, Phytochemical Survey of New Guinea, 1961–1965. This study is otherwise based on herbarium specimens. The contributing herbaria are listed below, with abbreviations from Lanjouw and Stafleu's *Index Herbariorum*, Part I, Ed. 5 (*Regnum Vegetabile*, 31, 1964).

|      |                                                                                  |
|------|----------------------------------------------------------------------------------|
| A    | Arnold Arboretum of Harvard University, Cambridge                                |
| BM   | British Museum (Natural History), London                                         |
| BO   | Herbarium Bogoriense, Djalan Raya, Bogor, Indonesia                              |
| BRI  | Botanic Museum and Herbarium, Brisbane                                           |
| CANB | C.S.I.R.O. Division of Plant Industry, Canberra                                  |
| GH   | Gray Herbarium of Harvard University, Cambridge                                  |
| K    | Royal Botanic Gardens, Kew                                                       |
| L    | Rijksherbarium, Leiden                                                           |
| LAE  | Department of Forests, Lae, Territory of New Guinea                              |
| MEL  | National Herbarium of Victoria, Melbourne                                        |
| MICH | University Herbarium, University of Michigan, Ann Arbor                          |
| NSW  | National Herbarium of New South Wales, Botanic Gardens, Sydney                   |
| NY   | New York Botanical Garden, New York                                              |
| P    | Muséum National d'Histoire Naturelle, Paris                                      |
| US   | U.S. National Museum (Department of Botany), Smithsonian Institution, Washington |

I wish to thank the directors and curators of these herbaria for making specimens in their care available to me. Thanks are also extended to Lindsay Smith for many helpful notes on the specimens loaned from Brisbane, and to Lily M. Perry, who translated into Latin the description of the single new species, *Flindersia unifoliolata*.

*Flindersia* R. Br. in Flinders' Voyage 2: 595. 1814. Type species: *Flindersia australis* R. Br.

*Oxleya* A. Cunn. ex Hook. in Hooker's Bot. Misc. 1: 246. 1830. Type species: *Oxleya xanthoxyla* A. Cunn. ex Hook. [*Flindersia xanthoxyla* (A. Cunn. ex Hook.) Domin].

<sup>1</sup> Identified alkaloids are listed for *Melia azadirachta* L. and *Naregamia alata* Wight & Arn. by Willaman and Schubert (1961, p. 146).



*Strzeleckya* F. Muell. in Hooker's Jour. Bot. Kew Gard. Misc. 9: 308. 1857. Type species: *Strzeleckya dissosperma* F. Muell. [*Flindersia dissosperma* (F. Muell.) Domin].

Small to large trees; branchlets, leaves, inflorescences, and fruits glabrous or variously covered with simple, stellate, or scale-like trichomes. Leaves alternate, subopposite or opposite, paripinnate, imparipinnate, trifoliolate, unifoliolate, or simple; leaflets 1–8 pairs, opposite or subopposite, usually pellucid-dotted, entire. Inflorescence terminal, terminal and upper-axillary, or upper-axillary, paniculate, usually densely flowered. Flowers bisexual, functionally staminate or (rarely) functionally carpellate or functionally neutral; sepals 5, distinct or connate basally, usually imbricate basally, often pubescent abaxially, glabrous adaxially, occasionally pellucid-dotted; petals 5, distinct, slightly to strongly imbricate in bud, glabrous to pubescent abaxially and adaxially, often pellucid-dotted; stamens 5, opposite the sepals, inserted on the disc near or at the base, inflexed apically or declinate, filaments glabrous or pubescent abaxially, anthers 2-celled, cordate, basifixed to dorsifixed; staminodes 5, without anthers, together with the stamens forming one androecial whorl, generally somewhat reflexed, glabrous, otherwise like the filaments in each species; disc cupular, between the stamens and the ovary, glabrous, deeply to shallowly folded-crenulate to folded-lobed in the plane of attachment of each stamen and staminode; gynoecium a single, 5-carpellate, 5-loculate pistil, ovary usually globose and shallowly 5-lobed, densely pubescent, usually with 5 apical glands around the base of the style, placentation axile, the placentae protruding into each locule and each with 1–3 superposed ovules on each side (2–6 per locule), style short, stigma capitate or peltate, 5-ridged and often 5-angled or -lobed. Fruit a 5-valved, 5-loculed, septicidal capsule, without a persistent axis; pericarp sub-woody to woody, the exocarp coarsely muricate or with low, mound-like excrescences. Seeds flat, oblong to elliptic, 2–6 per locule, 1–3 attached on each side of each of the placentae (dissepiments) which are much enlarged and persistent in the fruit; testa light to dark brown, forming a terminal wing or a wing that extends around the entire embryo and is elongated at both ends; endosperm absent; embryo elliptic to oblong, the cotyledons flattened, broadly to narrowly cordate, usually pellucid-dotted, the hypocotyl terminal or lateral.

The presence, abundance, and size of trichomes on the leaves and branchlets is variable and in several of the species these parts may range from glabrous to rather densely pubescent. Trichomes are consistently present on at least the youngest inflorescence branches or axils of inflorescence branches of all of the species except possibly *Flindersia unifoliolata*, where the inflorescence is not known. In species 1 through 5 only simple trichomes are known. In the remaining species stellate and/or lepidote trichomes are consistently present, at least in the inflorescence, and may or may not be mixed with simple trichomes.

Leaf arrangement is also variable. *Flindersiaournieri* has basically alternate leaves but occasional opposite leaves also occur. The same is



true of *F. amboinensis*. *Flindersia australis* also seems to have basically alternate leaves but specimens (and perhaps even trees?) may be found with entirely opposite leaves. Of the species that have basically opposite leaves, several vary to subopposite but none to alternate.

Four of the species, *Flindersiaournieri*, *F. laevicarpa*, *F. brayleyana* and *F. ifflaiana*, have leaves that are consistently paripinnate. Most of the other species with basically imparipinnate leaves often have occasional leaves, or even a majority of leaves, in some specimens, that are paripinnate. This is especially true in *F. pimenteliana*, *F. amboinensis*, *F. acuminata*, *F. schottiana*, *F. bourjotiana* and *F. australis*.

The simple leaves of *Flindersia unifoliolata*, *F. laevicarpa* var. *heterophylla* (where they occur only rarely), *F. maculosa* and *F. dissosperma* (where they occur only rarely) are obviously derived from compound leaves. I have only referred to the first two as unifoliolate, however, since they are the only ones in which the petiole is clearly homologous to a rachis.

Flower sex and the distribution of sexes varies considerably. The major trend, noted in *Flindersia pimenteliana*, *F. bourjotiana*, *F. bennettiana*, *F. collina*, *F. dissosperma*, *F. ifflaiana*, and *F. australis*, is for the replacement of many of the bisexual flowers in an inflorescence with functionally staminate flowers. In view of the fact that the fruits are usually large and heavy, and that rarely does more than one ever fully develop from a single inflorescence, this may be interpreted, from the standpoint of adaptation, as a means of reducing the number of potential fruit-forming flowers while still maintaining a large attractive inflorescence.

Separation of the valves of the fruit is essentially complete (two or sometimes three may remain attached basally, but are easily separated) in species 1 through 14. In the two remaining species, *Flindersia ifflaiana* and *F. australis*, all five valves remain attached basally and are relatively difficult to separate. This is apparently an important taxonomic character since it correlates, logically, I think, when seed dispersal is considered, with the type of wing formed by the seed: in those species in which valve separation is complete the seeds are winged at both ends whereas in *F. ifflaiana* and *F. australis* the seeds have a terminal wing only.

The position of the hypocotyl of the embryo is unusually variable in the genus but is apparently consistent for each species. In three species, *Flindersiaournieri*, *F. laevicarpa*, and *F. brayleyana* it is terminal, located at the apex of the embryo as it is oriented in the fruit. In the remaining species it is lateral, located at the adaxial margin of the embryo. In four of these species, *F. pimenteliana*, *F. unifoliolata*, *F. bourjotiana*, and *F. ifflaiana*, it is ascending at approximately a 45° angle, while in the remainder it is horizontal. Two of the species with the lateral-ascending type of hypocotyl, *F. pimenteliana* and *F. unifoliolata*, also have exclusively simple trichomes as do the four species with the terminal type of hypocotyl. This indicates, perhaps, that the lateral-ascending type is phylogenetically intermediate.

As far as I have been able to determine, chromosome numbers have been



published for only four species (Smith-White, 1954). These were based on counts from germinated seeds and are as follows: *Flindersia bourjotiana*, *F. xanthoxyla* (publ. as *F. oxleyana*), and *F. schottiana* (and "*F. pubescens*"):  $2n = 36$ . *Flindersia australis*:  $2n = 108$ .

Most of the species are important economically as commercial timbers. The woods have a number of uses ranging from general building to cabinet-making.

The general relationships of the sixteen species are presented in the following outline. I am reasonably confident that the species in each of the groups are more closely related to one another than to any of the other species. Between the groups, however, the only assumption I would make is that the species in Groups I and II are more closely related to one another than they are to any of the species in Groups III through VI.

### OUTLINE OF SPECIES RELATIONSHIPS

Trichomes simple; hypocotyl terminal or lateral-ascending.

Leaves paripinnate; hypocotyl terminal.

#### Group I

1. *F. fournieri*
2. *F. laevicarpa*
3. *F. brayleyana*

Leaves basically imparipinnate; hypocotyl lateral-ascending.

#### Group II

4. *F. pimenteliana*
5. *F. unifoliolata*

Trichomes (at least some of them) stellate and/or lepidote; hypocotyl lateral or (in two species) lateral-ascending.

Valves of fruit separating completely at maturity; seeds winged at both ends.

Ovules 6 in each locule.

Leaves alternate.

#### Group III

6. *F. amboinensis*
7. *F. acuminata*

Leaves opposite or subopposite.

#### Group IV

8. *F. schottiana*
9. *F. bourjotiana*
10. *F. xanthoxyla*

Ovules 4 in each locule.

#### Group V

11. *F. bennettiana*
12. *F. collina*
13. *F. dissosperma*
14. *F. maculosa*



Valves of fruit not separating completely at maturity; seeds winged at one end only. Group VI

15. *F. ifflaiana*

16. *F. australis*

In the citation of collections, where applicable, the abbreviations listed in the initial paper of this series (1966, p. 175) are used for collections numbered in sequence. There is one addition:

SN Australian Phytochemical Survey Number

### KEY TO THE SPECIES <sup>2</sup>

1. Trichomes exclusively simple; flowers (not known for *F. unifoliolata*) 2–4.2 mm. long; ovules 1 or 2 on each side of the placentae; exocarp of mature capsule with low, smooth, mound-like excrescences or coarsely muricate with excrescences to 4 mm. long; seeds 1 or 2 on each side of the dissepiments, winged at both ends. . . . . 2.
2. Leaves paripinnate or imparipinnate or (occasional leaves) unifoliolate; leaflets 1–5 pairs. . . . . 3.
3. Leaves paripinnate or (occasional leaves) unifoliolate; petals pubescent adaxially; exocarp of mature capsule with low, smooth, mound-like excrescences or, if muricate, then capsule less than 5.5 cm. long; seeds 1 on each side of the dissepiments. . . . . 4.
4. Leaves 6–30 cm. long; petiolules 2–13 mm. long; leaflets 1–4 pairs, 4–15 cm. long; capsule 2.9–5.2 cm. long; exocarp with low, smooth, mound-like excrescences or coarsely short-muricate. . . 5.
5. Leaves alternate, subopposite or (occasional leaves) opposite; flowers 3.8–4 mm. long; exocarp coarsely short-muricate. . . . . 1. *F. fournieri*.
5. Leaves opposite; flowers 2–3 mm. long; exocarp with low, smooth, mound-like excrescences or (rarely) coarsely short-muricate. . . . . 2. *F. laevicarpa*.
4. Leaves 27–45(–75) cm. long; petiolules 10–25 mm. long; leaflets 3–5 pairs, 8–18.5(–22) cm. long; capsule 6–10 cm. long; exocarp with low, smooth, mound-like excrescences. . . 3. *F. brayleyana*.
3. Leaves imparipinnate or (occasional leaves) paripinnate; petals glabrous adaxially; exocarp of mature capsule coarsely muricate, capsule 5.5–11.5 cm. long; seeds 2 on each side of the dissepiments. . . . . 4. *F. pimenteliana*.
2. Leaves unifoliolate or (occasional leaves) imparipinnate with a single pair of lateral leaflets. . . . . 5. *F. unifoliolata*.
1. Trichomes predominantly stellate or lepidote, not exclusively simple; flowers 2.5–10 mm. long; ovules 2–3 on each side of the placentae; exocarp of mature capsule coarsely muricate with excrescences to 10 mm. long; seeds 2–3 on each side of the dissepiments, winged at one end only or at both ends. . . . . 6.

<sup>2</sup>This key is intended to work with either flowering or fruiting material. It has been necessary, in its construction, to use statements in many of the couplets that are not completely contradictory, and it is, therefore, especially important for the user to follow through each couplet in its entirety.



6. Leaves opposite or subopposite, simple, trifoliolate, or imparipinnate, 1–36 cm. long; rachises (compound leaves) often winged laterally; leaflets (compound leaves) 1–3(–4) pairs; filaments glabrous; ovules 2 on each side of the placentae; capsule 2.3–7 cm. long; exocarp glabrous or glabrate; seeds 2 on each side of the dissepiments, winged at both ends. .... 7.
7. Leaves imparipinnate or trifoliolate (occasional leaves may be simple in *F. dissosperma*). .... 8.
8. Leaves 8.5–36(–45) cm. long; lateral leaflets with petiolules 1–6 mm. long; terminal leaflet on an extension of the rachis 0.9–3.5 cm. long; leaflets 6–18.5 cm. long; petals glabrous adaxially; capsule 4–7 cm. long; excrescences of the exocarp to 4 mm. long. .... 11. *F. bennettiana*.
8. Leaves 1.5–14 cm. long; lateral leaflets sessile; terminal leaflet sessile (often narrowly attenuate at the base); leaflets 0.6–9 cm. long; petals short-pubescent in the basal half or glabrous adaxially; capsule 2.3–5 cm. long; excrescences of the exocarp to 2 mm. long. .... 9.
9. Leaves 5–14 cm. long; leaflets 1–3 pairs; lateral leaflets 2–7 cm. long; main veins of leaflets 12–16 on each side of the midrib; inflorescence to 17 cm. long; flowers 4.7–5.3 mm. long; sepals appressed-pubescent; petals glabrate to appressed-pubescent abaxially, short-pubescent in the basal half adaxially; staminodes 2 mm. long; capsule 2.8–5 cm. long. 12. *F. collina*.
9. Leaves 1.5–6.3 cm. long; leaflets 1–2 pairs; lateral leaflets 0.6–3.7 cm. long; main veins of leaflets 8–10 on each side of the midrib; inflorescence to 7.5 cm. long; flowers 4–4.5 mm. long; sepals glabrous except for ciliate margin; petals glabrous on both sides; staminodes 0.5 mm. long; capsule 2.3–2.7 cm. long. .... 13. *F. dissosperma*.
7. Leaves simple. .... 14. *F. maculosa*.
6. Leaves alternate, opposite or subopposite, imparipinnate or paripinnate, (5.5–)8–57 cm. long; rachises angular to subterete; leaflets (1–)2–8 pairs; filaments pilose subapically to glabrous; ovules 2–3 on each side of the placentae; capsule 3.2–21 cm. long; exocarp minutely pubescent to glabrous; seeds 2–3 on each side of the dissepiments, winged at one end only or at both ends. .... 10.
10. Leaves opposite, subopposite or alternate (if alternate, then the flowers not more than 5 mm. long); leaflets 2.2–22 cm. long; petals glabrous to sparsely or densely pubescent abaxially; ovules 3 on each side of the placentae; capsule 6.5–21 cm. long; seeds 3 on each side of the dissepiments, winged at both ends. .... 11.
11. Leaves alternate. .... 12.
12. Leaves 18–57 cm. long; leaflets broadly elliptic to (rarely) elliptic-lanceolate, 8–20 cm. long, apex acuminate to acute or obtuse; sepals densely appressed-pubescent; stamens 2.2–3.6 mm. long, filaments pilose subapically to glabrous. .... 6. *F. amboinensis*.
12. Leaves 12.5–25(–35) cm. long; leaflets lanceolate to elliptic-lanceolate or narrowly elliptic, 5–10(–15) cm. long, apex narrowly long-acuminate to (occasionally) short and bluntly acuminate; sepals sparsely appressed-pubescent;



- stamens 1.5–2 mm. long, filaments glabrous. .... 7. *F. acuminata*.
11. Leaves opposite or subopposite. .... 13.
13. Leaflets (1–)2–8 pairs, chartaceous to subcoriaceous, not unusually brittle when dry, densely pellucid-dotted, (lateral leaflets) equal-sided to strongly oblique at the base; flowers 4–10 mm. long; petals sparsely appressed-pubescent abaxially, villous in the basal one-third to one-half or glabrous adaxially; exocarp glabrous to glabrate. .... 14.
14. Leaves 19–54 cm. long; leaflets (4–)5–8 pairs; bases of lateral leaflets narrowly to broadly rounded to cordate, unequal-sided and often strongly oblique; flowers 4–6 mm. long; petals villous in the basal one-third to one-half adaxially; excrescences of the exocarp rather thick-conical. .... 8. *F. schottiana*.
14. Leaves 9–33 cm. long; leaflets (1–)2–4 pairs; bases of lateral leaflets acute to obtuse, equal- or slightly unequal-sided; flowers 6–10 mm. long; petals glabrous adaxially; excrescences of the exocarp slender. .... 9. *F. bourjotiana*.
13. Leaflets (2–)3–5 pairs, membranaceous to chartaceous, very brittle when dry, sparsely pellucid-dotted or without pellucid dots, (lateral leaflets) often oblique at the base; flowers 4–5 mm. long; petals glabrous on both sides; exocarp minutely and densely pubescent. ... 10. *F. xanthoxyla*.
10. Leaves opposite, subopposite or alternate (if alternate, then the flowers 6.5–7.5 mm. long); leaflets (2.4–)3–13.5 cm. long; petals densely to sparsely pubescent abaxially; ovules 2 on each side of the placentae; capsule 3.2–8 cm. long; seeds 2 on each side of the dissepiments, winged at one end only. .... 15.
15. Leaves opposite, paripinnate; petiolules 4–9 mm. long; flowers 2.5–3 mm. long; petals glabrous or with a few papillae adaxially; staminodes 0.5 mm. long; capsule 3.2–5.5 cm. long; exocarp short-muricate, the excrescences (often becoming blunt with age) to 2 mm. long. .... 15. *F. ifflaiana*.
15. Leaves alternate, subopposite or opposite, imparipinnate or (occasional leaves) paripinnate; petiolules of lateral leaflets obsolete to 3(–5) mm. long; flowers 6.5–7.5 mm. long; petals sparsely pubescent in the basal one-half to two-thirds adaxially; staminodes 1.5 mm. long; capsule 4.6–8 cm. long; exocarp long-muricate, the excrescences to 10 mm. long. .... 16. *F. australis*.

1. *Flindersia fournieri* Panch. & Sebert, Bois Nouv. Caléd. (part 2) 228. 1872. Type: *Fournier & Sebert* 22, New Caledonia.

Medium to large trees; outer bark dark brownish black, finely fissured; heartwood reddish brown; branchlets, leaves, and inflorescences glabrous to puberulent or short-pubescent with simple trichomes. Leaves alternate or (occasional leaves) subopposite or opposite, paripinnate, 6–13 cm. long; rachis glabrous to puberulent; petiolules 4–9 mm. long; leaflets 1–2 pairs, coriaceous, with or without scattered pellucid dots, glabrous or sparsely



puberulent below, glabrous above, elliptic to elliptic-oblong, equal- or occasionally slightly unequal-sided, 4.3–8.2 cm. long, 1.8–3.8 cm. wide, base obtuse to cuneate, main veins 14–16 on each side of the midrib, apex obtuse to rounded, usually retuse. Inflorescence upper-axillary, to 10 cm. long, about as wide as long, axes and branches puberulent. Flowers bisexual, 3.8–4 mm. long; pedicels 0.5–2 mm. long; sepals puberulent, ciliate, broadly obovate to suborbicular, 1–1.5 mm. long; petals white, densely appressed-pubescent abaxially, tomentose adaxially, elliptic with a rather abruptly narrowed base, 3.5–4 mm. long; stamens declinate, about 2.2 mm. long (elongating considerably after anthesis), filaments sparsely to rather densely villous, anthers dorsifixed, mucronulate, about 0.5 mm. long; staminodes 1 mm. long; disc 1.3 mm. high; gynoecium about 2 mm. high and about 1 mm. wide, ovules 2 on each side of the placentae (one of each pair is smaller and apparently aborts). Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic to elliptic-oblong, 4–4.7 cm. long; exocarp drying medium to dark reddish brown, glabrous, muricate, the excrescences to 2 mm. long; endocarp yellow-brown to brown. Seeds 1 on each side of the dissepiments, winged at both ends, about 3.5 cm. long; hypocotyl terminal.

DISTRIBUTION. New Caledonia; rain forests at lower elevations.

New Caledonia. Baie de Couaoua, *Balansa* 1769 (A, BM, BO, K, NY); inland from Baie de Pirogues, *White* 2125 (A, US); N de la Baie de Prony, *Balansa* 163 (K); Prony, *Franc* 1738 (A, NSW 99637, US), 1738A (A, BM, BO, GH, K, NY); without definite locality, *Fournier & Sebert* 22 (BM-isotype).

Apparently most closely related to *Flindersia laevicarpa* but differing rather strongly in having mostly alternate leaves.

2. *Flindersia laevicarpa* White & Francis, Queensl. Agr. Dept. Bot. Bull. 22: 8. t. 9. 1920. Type: *Fraser*, July, 1919, Queensland, Atherton District.

#### KEY TO THE VARIETIES

1. Leaves 12–30 cm. long; leaflets 2–4 pairs; filaments glabrous; capsule 2.9–4 cm. long; exocarp with smooth, slightly elevated, mound-like excrescences. .... 2a. var. *laevicarpa*.
1. Leaves usually less than 12 cm. long (occasional leaves to 28 cm. long); leaflets 1–2(–3) pairs; filaments sparsely to densely pubescent; capsule 3–5.2 cm. long; exocarp as above or grading to bluntly short-muricate with excrescences to 0.8 mm. long. .... 2b. var. *heterophylla*.

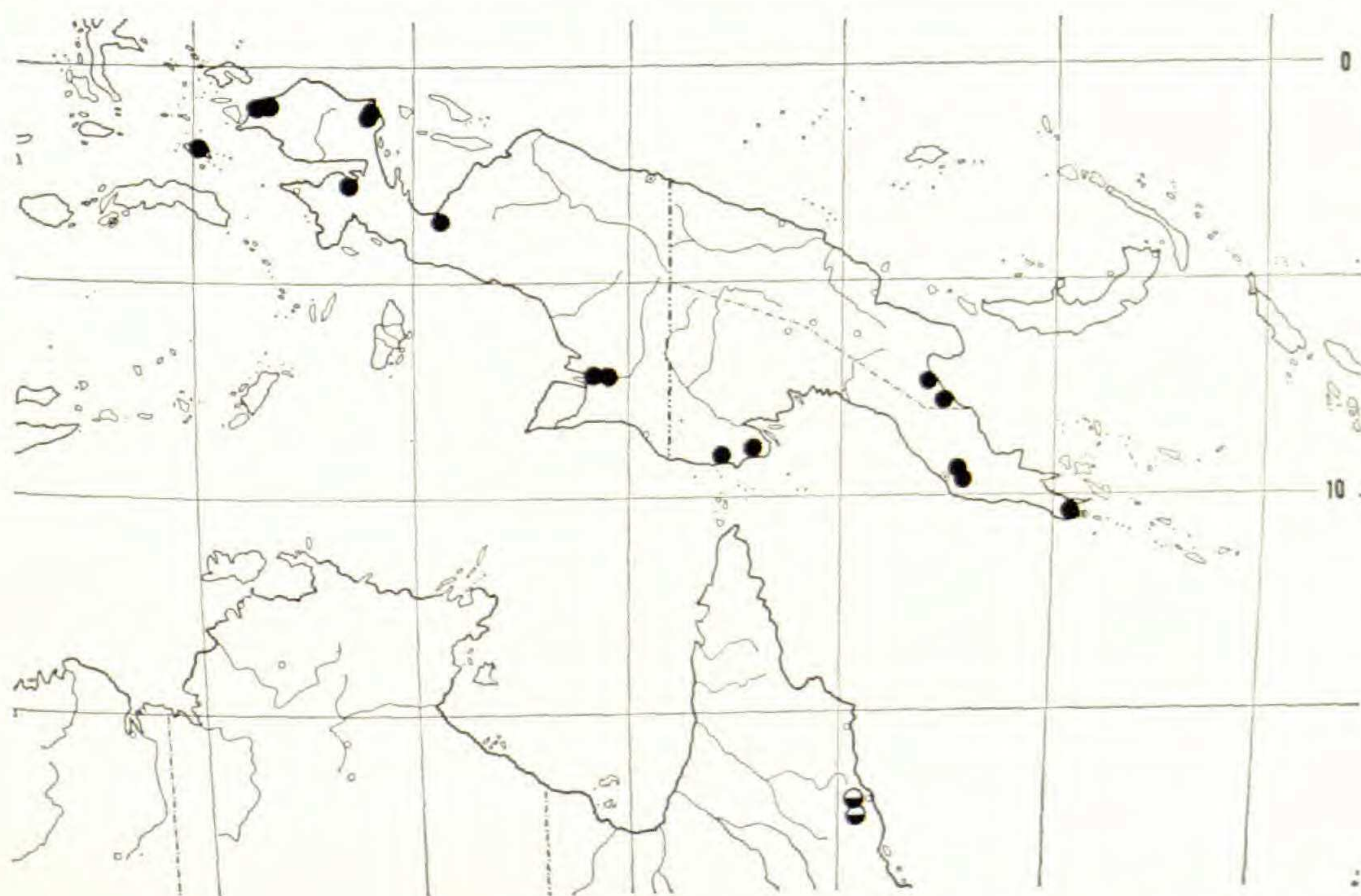
- 2a. *Flindersia laevicarpa* White & Francis var. *laevicarpa*.

Medium trees to 21 m.; outer bark brown with pustular lenticels; inner bark cream with yellow flecks; sapwood whitish; heartwood pinkish brown; branchlets, leaves, and inflorescences glabrous to puberulent or short-pubescent with simple trichomes. Leaves opposite, paripinnate, 12–30



cm. long; rachis glabrous; petiolules 3–13 mm. long; leaflets 2–4 pairs, subcoriaceous to coriaceous, rather densely pellucid-dotted, glabrous or sparsely puberulent below, glabrous above, elliptic-lanceolate to broadly elliptic, usually quite unequal-sided, 7.9–10.7 cm. long, 1.9–3.5 cm. wide, base acute to cuneate, main veins about 15 on each side of the midrib, apex gradually tapering to acuminate. Inflorescence terminal or upper-axillary and terminal, to 30 cm. long, about one-half as wide as long, youngest branches and axils of older branches puberulent. Flowers bisexual, about 3 mm. long; pedicels about 0.2 mm. long; sepals sparsely puberulent, broadly ovate, about 1 mm. long; petals drying maroon, appressed-pubescent abaxially, short-pubescent adaxially, elliptic, 2.5 mm. long; stamens inflexed apically, about 1.5 mm. long, filaments glabrous, about 1 mm. long, anthers basifixed, mucronulate, about 0.5 mm. long; staminodes about 0.5 mm. long; disc about 0.5 mm. high; gynoeceum about 0.7 mm. high and about 1 mm. wide, ovules 1 or 2 on each side of the placentae (where two, one is smaller and apparently aborts). Capsule separating (or easily separable) into 5 distinct valves at maturity, narrowly elliptic, 2.9–4 cm. long; exocarp drying medium to dark reddish brown, glabrous, almost smooth at maturity, the excrescences represented by slightly elevated mounds; endocarp pale brown. Seeds 1 on each side of the dissepiments, winged at both ends, 2.5–3.2 cm. long; hypocotyl terminal.

ILLUSTRATIONS. WHITE, C. T., & W. D. FRANCIS, *ibid.* FRANCIS, W. D., Australian Rain-forest Trees 427, 431. 1951.



MAP 1. Distributions of *Flindersia laevicarpa* White & Francis var. *laevicarpa* (half-filled circles) and *F. laevicarpa* var. *heterophylla* (Merr. & Perry) Hartley (dots).



**DISTRIBUTION.** Danbulla to Gadgarra, Cook District, Queensland; rain forests at about 700 meters. See MAP 1.

**Queensland.** COOK DISTRICT: Danbulla, *Jones 1116* (BRI, CANB), *Tracey 2192* (CANB), *Webb 5129* (CANB); Tinaroo Range between Mt. Edith and Danbulla, *Smith & Webb 3369* (BRI); Atherton Tableland, *Tardent X232* (A, BRI), *Tardent s.n.* (MEL); Atherton District, *Fraser*, July 1919 (BRI-holotype of *Flindersia laevicarpa* White & Francis), *Webb 2503* (CANB), *5059* (CANB); Gadgarra, *Dreghorn*, January 9, 1934 (BRI).

2b. *Flindersia laevicarpa* White & Francis var. *heterophylla* (Merr. & Perry) Hartley, stat. nov.

*Flindersia heterophylla* Merr. & Perry, Jour. Arnold Arb. 20: 331. 1939.  
Type: *Brass 8495*, Papua, Wassi Kussa River.

Medium to large trees to 45 m.; outer bark mottled, brown or gray, smooth or shallowly fissured; inner bark whitish, yellow-brown, pink, or red, often flecked with orange or red; sapwood white to yellow-brown; heartwood brown to pink, often scented. Leaves 6–12 (–28) cm. long; petiolules 2–8 mm. long; leaflets 1–2 (–3) pairs (occasional leaves unifoliate due to early abscission of one leaflet of a single pair), chartaceous to coriaceous, narrowly to broadly elliptic to elliptic-ovate, equal- or slightly unequal-sided, 4–15 cm. long, 1.5–6.5 cm. wide, main veins 10–12 on each side of the midrib. Inflorescence 12–22 cm. long, about as wide as long. Flowers 2–3 mm. long; pedicels 0.5–1.7 mm. long; sepals sparsely to rather densely appressed-pubescent, 0.5–0.9 mm. long; petals cream to yellowish, red, or purple, densely appressed-pubescent abaxially, densely tomentose adaxially, 2–2.5 mm. long; stamens 1–1.2 mm. long, filaments sparsely to densely pubescent with stiff, ascending trichomes, anthers obtuse; ovules 1 on each side of the placentae. Capsule 3–5.2 cm. long; exocarp at maturity almost smooth (as in var. *laevicarpa*) to bluntly short-muricate with excrescences to 0.8 mm. long; endocarp pale brown and often flecked with orange. Seeds 2.5–4.5 cm. long. Otherwise as in var. *laevicarpa*.

**DISTRIBUTION.** New Guinea, from Misool Island to Milne Bay; well-drained rain forests and monsoon forests; sea level to about 1000 meters. See MAP 1.

**West New Guinea (West Irian) and neighboring islands.** MISOOL ISLAND: Salafen, *Malessij NIFS bb 14381* (BO). VOGELKOP DIVISION: Sorong, *NIFS bb 15459* (BO); Mlasoen Hills E of Sorong, *van Royen 3399* (BO, K, L, LAE); Waren, 60 miles S of Manokwari, *Kanehira & Hatusima 13017* (A, BO); Ransiki Onderafd, Meos Waar, Wandoswaar, *Kalkman BW 3566* (BO, K, L, LAE); Babo, *NIFS bb 22301* (A, L). GEELVINK BAY DIVISION: Boemi, 30 km. inland from Nabire, *Kanehira & Hatusima 12738* (A, BO). SOUTHERN DIVISION: Bovess Digoel, *Tetelepta NIFS bb 14523* (BO); near Omba along Digoel River, *Vers-teegh BW 4876* (CANB, L, LAE). **Territory of New Guinea.** MOROBE DISTRICT: Kui, *Ridsdale NGF 31636* (LAE); Mageri, *Webb 5322* (CANB). **Papua.** WESTERN DISTRICT: Tarara, Wassi Kussa River, *Brass 8495* (A-holotype of *Flindersia heterophylla* Merr. & Perry; BRI, L, LAE-isotypes), *8542* (A, BRI, L, LAE); Oriomo



River, *McDonald NGF 13012* (BM, K, L, LAE, NSW 99636), *White*, May 1960 (K, L, LAE), *White & Gray NGF 10397* (mixed coll. — fruits of *Flindersia ifflaiana*) (A, BRI, CANB, K, L, LAE), *NGF 10398* (A, BO, BRI, L, LAE). CENTRAL DISTRICT: Jogerri Subdistrict, Iarowari, *Havel NGF 17384* (BO, K, L, LAE, NSW 99635); tributary of the Laloki River 2 miles E of Rouna, *Hartley 10705* (A, L, LAE); Sogeri Road, *Eddowes NGF 13086* (LAE); Budanumu, near Sogeri, *Womersley & Barrett NGF 4184* (BO, BRI, L, LAE); Sogeri-Rouna Divide 2 miles W of Sogeri, *Schodde 2862* (BO, K, L, LAE, NSW 99633). MILNE BAY DISTRICT: Modewa Bay, Modewa, *Brass 28881* (A, CANB, K, L, LAE, US), *28906* (A, K, L, LAE, US); top of main divide above Mapo, *Smith NGF 1392* (L, LAE, NSW 99634).

Apparently the only character that does not overlap in these two varieties is the pubescence of the filaments. This, however, is a variable character in several other species of the genus.

It is only rarely that short-muricate capsules occur in var. *heterophylla*, and those seemed a little immature. Otherwise, in that variety, the exocarp may be equally as smooth as it is in var. *laevicarpa*.

*Flindersia laevicarpa* is apparently more closely related to *F. brayleyana* than to *F.ournieri*, both having opposite or subopposite leaves and a tendency toward blunt rather than muricate excrescences on the exocarp. They differ rather strongly, however, in the size of leaves, length of petiolules and the size of fruit. That they are genetically quite dissimilar may also be indicated by the fact that their ranges are sympatric on the Atherton Tableland in northeast Queensland and they apparently occupy the same habitat.

3. *Flindersia brayleyana* F. Muell. Frag. Phytogr. Austral. 5: 143. 1866. Type: *Dallachy*, Queensland, Herbert's River.

*Flindersia chatawaiana* F. M. Bailey, Queensl. Agr. Jour. 5: 387. t. 138. 1899. Syntypes: *J. F. Bailey*, June 1899, Queensland, Martintown and July 1899, Queensland, Middle Tully River.

Medium to large trees to 35 m.; outer bark gray, flaky, with shallow longitudinal fissures; inner bark reddish or pinkish; wood generally pinkish; branchlets and inflorescences glabrous to puberulent or short-pubescent with simple trichomes. Leaves opposite or subopposite, paripinnate, 27–45(–75) cm. long; rachis glabrous; petiolules 10–25 mm. long; leaflets 3–5 pairs, subcoriaceous, densely pellucid-dotted, glabrous, broadly elliptic to ovate-elliptic, mostly unequal-sided and occasionally subfalcate, 8–18.5(–22) cm. long, 3.3–7.5(–9) cm. wide, base acute to cuneate, often oblique, main veins 8–12 on each side of the midrib, apex obtuse to acuminate. Inflorescence upper-axillary and terminal, to 23 cm. long, usually a little wider than long, youngest branches puberulent. Flowers bisexual, 3–4 mm. long; pedicels 1.5–2 mm. long; sepals sparsely puberulent, ciliolate, ovate-triangular, about 0.5 mm. long; petals creamy white, puberulent in the basal three-fourths abaxially, tomentulose in the basal one-half adaxially, oblong-elliptic to elliptic, 2.5–3.5 mm. long; stamens declinate, 2–2.2 mm.



long, filaments villous subapically, anthers subdorsifixed, bluntly mucronate, 0.75–1 mm. long; staminodes 0.75 mm. long; disc about 0.75 mm. high; gynoecium 1–1.4 mm. high, about 1 mm. wide, ovules 1 on each side of the placentae. Capsule separating (or easily separable) into 5 distinct valves at maturity, oblong-elliptic, 6–10 cm. long; exocarp drying medium brown, glabrous, almost smooth at maturity, the excrescences represented by slightly elevated mounds; endocarp cream to reddish brown. Seeds 1 on each side of the dissepiments, winged at both ends, 4.5–6 cm. long; hypocotyl terminal.

ILLUSTRATIONS. BAILEY, F. M., *ibid.* FRANCIS, W. D. Australian Rain-forest Trees 424, 426. 1951.

DISTRIBUTION. Northeast Queensland, vicinity of Cairns south to Rockingham Bay; upland rain forests.

Queensland. COOK DISTRICT: Daintree River, *Pentracke*, 1889 (MEL); Kamerunga, *Cowley*, February 1905 (BRI); Bonjee, *Doggrell* A35 (A, BRI), *Jones* 2094 (CANB); Danbulla, *Webb* 5130 (CANB); Atherton Tableland, *Wyat* 13 (BRI); Martintown, *Bailey*, June 1899 (BRI-syntype of *Flindersia chatawaiana* F. M. Bailey); Gadgarra, *Dreghorn* 13 (BRI), 14 (BRI), *Kajewski* (NY); Wongabel Forestry Nursery ca. 5 miles SSE of Atherton, *Smith*, August 19, 1948 (BRI); the Crater, ca. 11 miles S of Atherton, *Smith* 3824 (BRI); Forestry Reserve 99, Great Dividing Range several miles SW of Atherton, *Smith*, August 1948 (BRI); Glenallan, Malanda, *Hayes* (BRI); Parish of Ramleh, Country of Coadwell, *Webb* SN 5403 (CANB); Middle Tully River, *Bailey*, July 1899 (BRI, K-syntype of *Flindersia chatawaiana* F. M. Bailey). NORTH KENNEDY DISTRICT: Koolmoon Creek Area ca. 11 miles SSE of Ravenshoe, *Smith* 5285 (BRI); Cardwell, *Anonymous* (BRI, NSW 99678); Rockingham Bay, *Anonymous* (BO, BM, BRI, GH, MEL, P, US), *Dallachy* (MEL); Herbert's River, *Dallachy* (MEL-holotype of *Flindersia brayleyana* F. Muell.; K-isotype). SOUTH KENNEDY DISTRICT: Mackay Coast (native?), *Anonymous* (NSW 99679). WIDE BAY DISTRICT: Imbil (native?), *Clemens* 43373 (A, US, NY), *Wallin*, September 21, 1948 (LAE). Without definite locality: *Wood Technology Dept. Queensland Forestry Service* 54 (A, NY). Cultivated. Queensland. Wide Bay District, Forestry Station, Imbil, *Clemens* 43213 (A, NY, US), December 22, 1943 (BRI). New South Wales. West Pennant Hills, *Anonymous*, March 3, 1966 (NSW 99680).

*Flindersia chatawaiana* was previously placed in synonymy of *F. brayleyana* by C. T. White (1921).

4. *Flindersia pimenteliana* F. Muell. Frag. Phytogr. Austral. 9: 132. 1875. Lectotype: *Dallachy*, Queensland, Rockingham Bay.

*Flindersia mazlini* F. M. Bailey, Queensl. Agr. Jour. 5: 388. t. 138. 1899. Type: J. F. Bailey, July 8, 1899, Queensland, Evelyn.

*Flindersia chrysantha* Merr. & Perry, Jour. Arnold Arb. 22: 59. 1941. Type: *Brass & Versteegh* 11128, West New Guinea, Bele River.

Large trees to 40 m.; outer bark brown to gray, smooth or slightly roughened with pustular lenticels or shallow longitudinal fissures; inner



bark pink or reddish brown grading to white or yellowish toward the cambium; sapwood white or yellowish white to pale pink, lustrous; heartwood pink to reddish brown, lustrous; branchlets and inflorescences glabrous to puberulent or short-pubescent with simple trichomes. Leaves opposite to strongly subopposite, imparipinnate or (occasional leaves) paripinnate, 8–34 cm. long; rachis glabrous; petiolules of lateral leaflets 3.5–11 mm. long, terminal leaflet on an extension of the rachis 1.2–4 cm. long; leaflets 1–3(–5) pairs, chartaceous to subcoriaceous, with or without scattered pellucid dots, glabrous, elliptic to elliptic-oblong, often unequal-sided and occasionally subfalcate, 3.5–16 cm. long, 1.3–6.5 cm. wide, base obtuse to cuneate, usually oblique, main veins 9–14 on each side of the midrib, apex gradually tapering to acuminate. Inflorescence terminal or upper-axillary and terminal, to 30 cm. long, usually about as wide as long, axes and branches puberulent to short-pubescent. Flowers bisexual, functionally unisexual or functionally neutral, 2.5–4.2 mm. long; pedicels 1–1.5 mm. long; sepals sparsely puberulent, ciliate or ciliolate, broadly ovate, 0.8–1.2 mm. long; petals white to cream, yellow, or red, glabrous or sparsely puberulent abaxially, glabrous or with scattered papillae adaxially, elliptic-oblong, 2.5–4 mm. long; stamens declinate, about equally developed in bisexual, functionally staminate, functionally carpellate and functionally neutral flowers except lacking pollen in the latter two, 2–2.5 mm. long, filaments pilose subapically or occasionally glabrous, anthers subdorsifixed, acute to mucronulate, about 0.5 mm. long; staminodes 1–2 mm. long; disc in bisexual and functionally carpellate flowers thin, 0.7–1 mm. high; disc in functionally staminate and functionally neutral flowers comparatively thick, about 0.5 mm. high; gynoecium in bisexual and functionally carpellate flowers about 2 mm. high and about 1 mm. wide, ovules 2 on each side of the placentae; gynoecium in functionally staminate and functionally neutral flowers poorly differentiated, narrowly conical, about 1 mm. high, without ovules. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic-oblong to oblong, 5.5–11.5 cm. long; exocarp drying reddish brown, glabrous, muricate, the excrescences densely crowded, unequal in length, to 4 mm. long; endocarp yellow-brown or cream and reddish-brown maculate, or not maculate and brown to reddish-brown. Seeds 2 on each side of the dissepiments, winged at both ends, 4–6 cm. long; hypocotyl lateral, ascending.

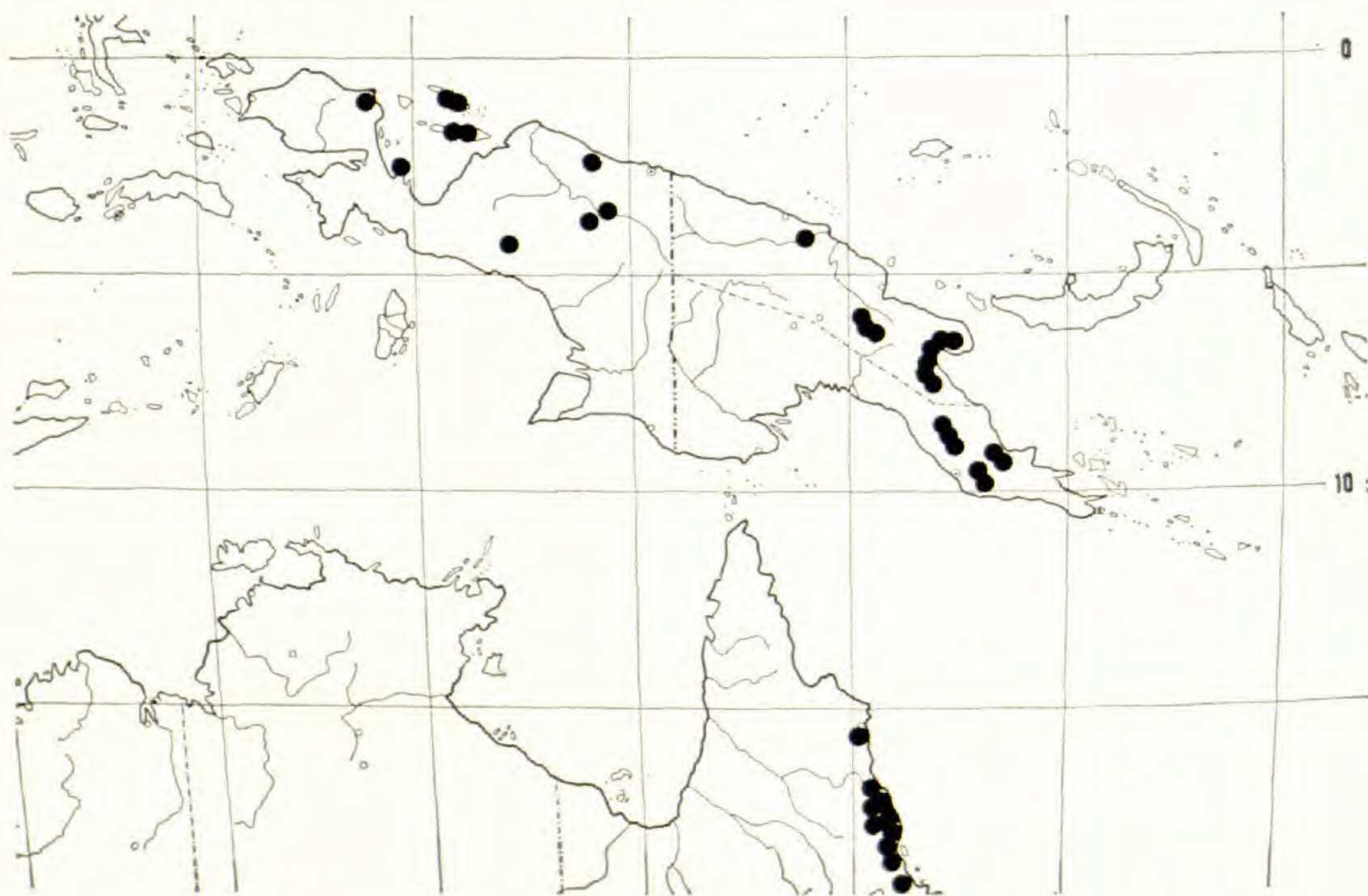
ILLUSTRATIONS. BAILEY, F. M., *ibid.* FRANCIS, W. D., Australian Rainforest Trees 425, 426. 1951.

DISTRIBUTION. New Guinea, from the Vogelkop Peninsula to southeastern Papua, and northeastern Queensland, between Cooktown and Townsville; upland rain forests, 100–2700 meters. See MAP 2.

West New Guinea (West Irian) and neighboring islands. BIAK ISLAND: Mansforbo, *Moll BW* 9552 (L, LAE), *BW* 9571 (L, LAE), *BW* 9657 (L, LAE); near Parieri, *Moll BW* 9745 (L, LAE); Saribi, *van Petersen BW* 2419 (L, LAE). JAPEN ISLAND: Aisao, *Schram BW* 10517 (L, LAE); Seroei, *NIFS bb* 30466 (L), *NIFS*



bb 30526 (A, L). VOGELKOP DIVISION: Mt. Krabo, South Manokwari, *Koster* BW 10786 (L, LAE). GEELVINK BAY DIVISION: Wandammen Peninsula, Wondiwai Mts., *Koster* BW 13797 (LAE). HOLLANDIA DIVISION: Bodem River, 60 km. SE of Sarmi, *Iwanggin* BW 5889 (CANB, L, LAE), *Koster* BW 8064 (CANB, L, LAE), BW 1874 (CANB, L, LAE); Bele River, 18 km. NE of Lake Habbema, *Brass & Versteegh* 11128 (A-holotype of *Flindersia chrysantha* Merr. & Perry; BRI, L, LAE-isotypes); Idenburg River, 6 km. SW of Bernhard Camp, *Brass & Versteegh* 12535 (A, L). CENTRAL DIVISION: Nassau Mountains, *Docters van Leeuwen* 10478 (A, BO, BRI, K, L), 10618 (A, K, L), 10682 (A, BO, K, L). **Territory of New Guinea.** SEPIK DISTRICT: without definite locality, *Ledermann* 9825 (L). EASTERN HIGHLANDS DISTRICT: Collins' Sawmill, Goroka, *Collins* W966 (LAE); Leahey's logging area above Goroka, *Womersley & Floyd* NGF



MAP 2. Distribution of *Flindersia pimenteliana* F. Muell.

6132 (A, BO, BRI, K, L, LAE);  $\frac{3}{4}$  mile SW of Daulo, *Saunders* 894 (CANB, L, LAE); Aiyura, *Smith* NGF 1075 (LAE), *Womersley* NGF 3391 (BRI, CANB, LAE); Sasaura, *Hartley* 12018 (A, L, LAE), 12018A (LAE). MOROBE DISTRICT: Ogeramang, *Clemens* 4739 (A), 5086 (A); Sambanga, *Clemens* 6825 (A); hillside above Busu River, *Henty* NGF 14833 (BO, K, L, LAE, NSW 99652); Yalu, *Womersley* NGF 3192 (A, BRI, K, LAE); Oomsis Creek, 18 miles W of Lae, *Hartley* 10493 (A, L, LAE); Bulolo, *Brass* 29153 (A, K, L, LAE, NY, US), *Floyd* NGF 7472 (A, BRI, L, LAE, NSW 99653), NGF 7527 (A, BRI, K, L, LAE, NSW 99659), *Floyd & Morwood* NGF 6204 (A, BO, BRI, K, L, LAE, NSW 99656, US), *McAdam* 291 (LAE), *Ross* NGF W1001 (A, BO, BRI, L, LAE, NSW 99660), *Womersley & Brass* NGF 11025 (A, BRI, K, L, LAE); W of Bulolo near Bulolo-Watut Divide, *Frodin & Hill* NGF 26355 (K, L, LAE, NSW 99658), Upper Long Island Creek, near Bulolo, *Havel & Henry* NGF 17024 (A, BO, BRI, CANB, K, L, LAE), Upper Nauwatabanda logging area, near Bulolo, *Havel & Kairo* NGF 11140 (BRI, K, L, LAE), NGF 11142 (BO, K, L, LAE); near Dengalu Village, *Womersley* NGF 19063 (K, L, LAE, NSW 99668); Wau, *White* NGF 2529 (L, LAE, NSW 99655); Edie Creek,



*Streimann NGF 17476* (K, LAE); Kauli Creek, 5 miles S of Wau, Hartley 11513 (A, LAE), *Henty NGF 14726* (K, L, LAE, NSW 99654), *Millar NGF 14516* (K, L, LAE, NSW 99657), *van Royen NGF 16302* (BO, L). **Papua.** CENTRAL DISTRICT: Lala River, *Carr 15805* (CANB, L), 15989 (K, L); Isuarava, *Carr 15475* (L), 15569 (L), 15969 (K, L); Mafulu, *Brass 5339* (A, NY, US); Boridi, *Carr 13152* (A, K, L, NY), 14408 (A, K, L, NY), 14808 (L), 14910 (A, K, L, NY); Mt. Obree to Laruni Spur, *Lane-Poole 382* (BRI). NORTHERN DISTRICT: Managalase area, S side of Hydrographers Range near Siarane, *Pullen 6263* (CANB); Bariji-Managalase area, N side of Sibium Range, S of Toma, *Pullen 6358* (CANB, LAE), 6387 (CANB, LAE). **Queensland.** COOK DISTRICT: Cape York Peninsula, Mt. Finnegan, *Brass 20322* (A); Great Dividing Range ca. 6 miles S of Mossman and near "Devil Devil Creek", *Smith 3953* (BRI); Mt. Spurgeon, *White 10596* (A, K); Danbulla, *Jones 1117* (CANB); Atherton Tableland, Juara Creek area, near Danbulla, *Smith 3780* (BRI); Atherton Tableland, Lake Barrine, *Kajewski 1114* (A, BRI, NY, P); Atherton, *Mocatta*, February 1913 (BRI); Atherton Area, *Webb 2504* (CANB); Atherton, Herberton Road, East Barron, *Webb 747* (CANB); Yungaburra, *Dreghorn*, December 1935 (A, BRI, K); Gadgarra, *Dreghorn 22E* (BRI), January 9, 1934 (A, BRI, NY), *White 1566* (A, BRI); Glenallan, Malanda, *Hayes* (BRI); Paronella Park, on Mena Creek, ca. 14 miles S of Innisfail, *Smith*, August 5, 1948 (BRI). NORTH KENNEDY DISTRICT: Koolmoon Creek, ca. 11 miles SSE of Ravenshoe, *Smith 4588X* (BRI); Evelyn, *Bailey*, July 8, 1899 (BRI-holotype of *Flindersia mazlini* F. M. Bailey; K-isotype); Coast Range, *Anonymous*, February 1866 (BRI); Rockingham Bay, *Dallachy* (MEL-lectotype of *Flindersia pimenteliana* F. Muell.; BM, BO, K, NSW 99651), *Anonymous* (BRI, MEL); Mt. Macalister, *Dallachy*, April 11, 1869 (MEL); Mt. Fox, *Clemens*, September-December 1949 (GH, MICH).

C. T. White (1921) has previously placed *Flindersia mazlini* in the synonymy of *F. pimenteliana*.

The type collection of *Flindersia chrysantha* was made at 2300 m. in West New Guinea and is typical of a number of collections from mountain rain forests in New Guinea. The leaflets of these collections tend to be of thicker texture and have more prominent veins and less tapering bases and apices than typical *F. pimenteliana*. These are not sharply defined differences, however, and probably are only environmental modifications. Merrill and Perry noted in their original description of *F. chrysantha* that the petals differed from those of *F. pimenteliana* in color (yellow *vs.* red) and pubescence (glabrous *vs.* pubescent abaxially). With the larger number of collections that are now available it can be seen that both of these characters are quite variable in typical *F. pimenteliana* from lower elevations in New Guinea. Flower color ranges from red to pink, cream or white, and the petals range from pubescent to glabrous abaxially.

Flower sex and the distribution of sexes is extremely variable in this species. In some collections, such as *Moll BW 9745* and *Dreghorn*, December 1935, all of the flowers appear to be perfect. In others, such as *Dreghorn*, January 9, 1934, some appear to be perfect and many appear to be functionally staminate. A condition where all of the flowers on a specimen appear to be functionally staminate is found in a number of collections from New Guinea including *Brass 29153* and *Carr 14910*. Still other collections, such as *Brass 11128* and *Hartley 12018* have a majority



of functionally carpellate flowers mixed with flowers that appear to be functionally neutral.

Insect galls are often formed from the flowers in New Guinea. These have the appearance of young fruits and were occasionally mistaken for them by collectors.

Other than *Flindersia unifoliolata*, which seems to be very closely related, *F. pimenteliana* does not appear to have any very close relatives. As is indicated above in the outline of species relationships, I think its having exclusively simple trichomes would place it closer to those species which share that character than to any of the others, but the leaf difference and especially the difference in hypocotyl position makes any very close relationship seem unlikely.

#### 5. *Flindersia unifoliolata* Hartley sp. nov.

Arbor usque 15 m. alta; ramulis, rhachidibus et laminis subtus glabris vel minute et sparse puberulis, pilis simplicibus. Folia opposita vel subopposita, unifoliolata vel interdum imparipinnata et unijuga, 3–9 cm. longa; petiolulis foliolorum lateralium 1–4 mm. longis, rhachidi ad apicem extensa usque 1 cm. longa foliolum terminale ferente; petiolis foliorum unifoliolorum usque 1.8 cm. longis; laminis subcoriaceis, consperse pellucido-punctatis, ellipticis, equilateris vel parum inaequilateris, 3–8 cm. longis, 1.4–3.2 cm. latis, basi acuta usque cuneata plerumque aequilatera, venis primariis utrinque 8–16, apice obtuse acuminata. Capsula secedens in valvas distinctas maturite, elliptica, 7.8 cm. longa; exocarpio in sicco atro-rufescente, glabro, muricato, processibus inaequilongis, usque 2 mm. longis; endocarpio brunnescente et leviter ferrugineo-maculato. Semina 2 in quoque latere dissepimentorum, utrinque alata, 3.5–4 cm. longa; hypocotylo laterali parum adscendente. Flores non visi. Holotypus: *Sayer 136* (MEL).

Queensland. COOK DISTRICT: Mt. Bellenden Ker, alt. 5200 ft., *Sayer 136* (MEL-holotype); Mt. Bartle Frere, in low scrub, 4000–5000 ft., *Martin & Hyland 1881* (BRI).

The localities of the above collections are about 15 miles apart about 40 miles south of Cairns, Queensland. The holotype is a fruiting branch while the *Martin & Hyland* specimen is sterile.

Closely related to *Flindersia pimenteliana* which appears to be restricted to lower elevations in this part of Queensland. The fruits and seeds of the two species appear roughly identical.

#### 6. *Flindersia amboinensis* Poir. in Lam. Encycl. Suppl. 4: 650. 1816. Neotype: *DeVriese & Teysmann*, Moluccas, Ceram.

*Arbor radulifera* Poir. in Lam. Encycl. 6: 58. 1804 (provisional name, based on plate and description by Rumphius, Herb. Amboin. 3: 201. t. 129. 1743).  
*Flindersia radulifera* Spreng. Geschicht. Bot. 2: 76. 1818 (*nomen illegit.*).



*Flindersia macrocarpa* Lane-Poole ex White & Francis, Proc. Roy. Soc. Queensl. 38: 232. t. 3. 1927. Type: Lane-Poole 362, Papua, Owen Stanley Range.

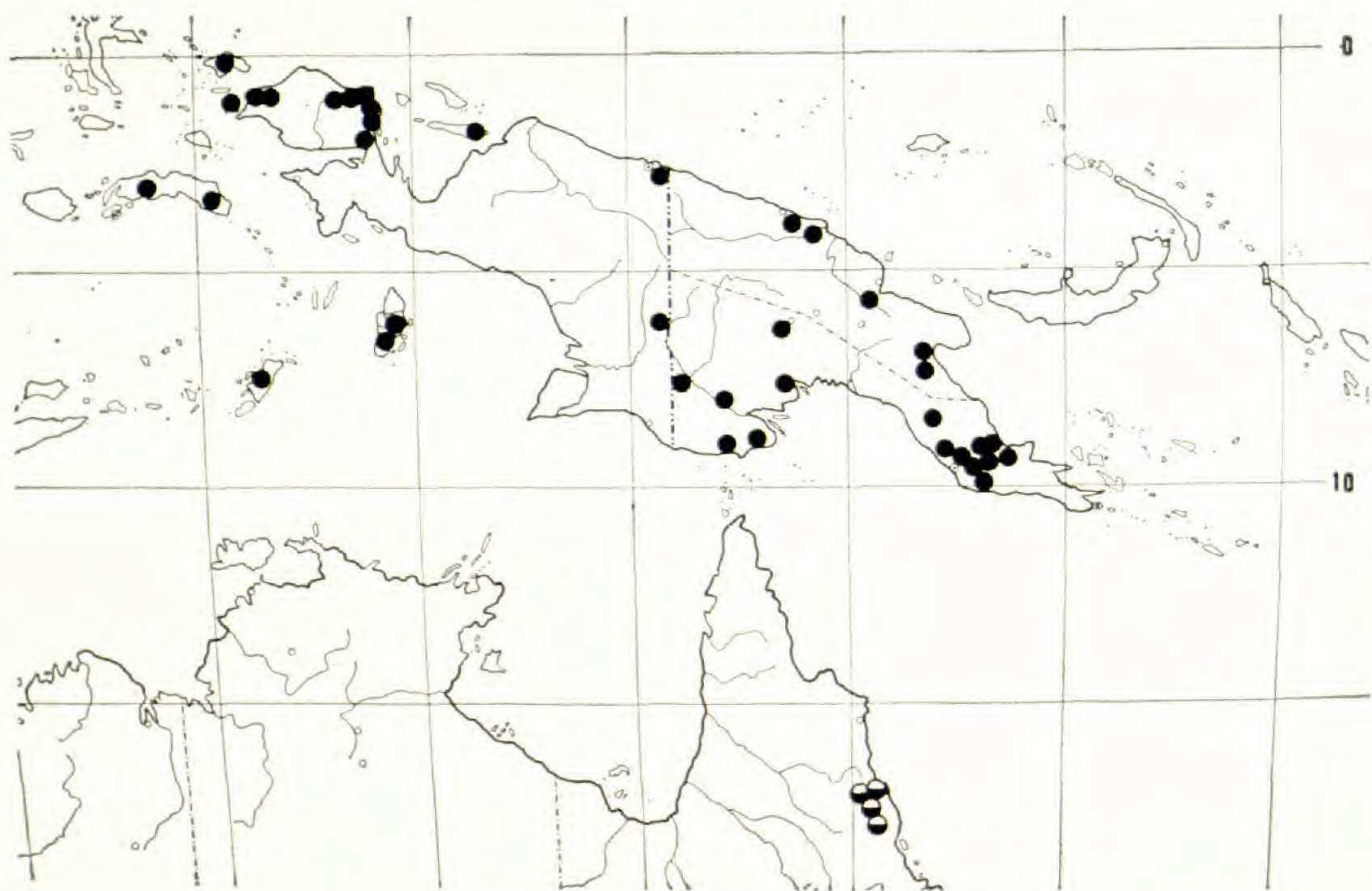
Large trees to 45 m.; outer bark gray to brown, smooth or slightly roughened; inner bark usually yellow grading to white or yellow-brown toward the cambium; sapwood white, cream, or yellow; heartwood yellow-brown; branchlets, leaves and inflorescences glabrous to pubescent with mostly minute, predominantly stellate trichomes. Leaves alternate, imparipinnate or (occasional leaves) paripinnate, 18–57 cm. long; rachis glabrate to appressed- or soft-pubescent; petiolules of lateral leaflets 2–8 mm. long, terminal leaflet on an extension of the rachis 1–4.3 cm. long; leaflets 2–4(–5) pairs, chartaceous to subcoriaceous, with or without scattered pellucid dots, glabrous to appressed- or soft-pubescent below, glabrous or occasionally finely pubescent along the midrib above, elliptic to elliptic-lanceolate, usually strongly unequal-sided and occasionally falcate, 8–20 cm. long, 3–9.5 cm. wide, base acute to broadly rounded, usually oblique, main veins 10–20 on each side of the midrib, apex obtuse to acuminate. Inflorescence terminal, 18–30 cm. long, usually about as wide as long, axes and branches densely appressed- to soft-pubescent. Flowers bisexual, 3.5–5 mm. long; pedicels obsolete to 1.7 mm. long; sepals densely appressed-pubescent, ciliolate, broadly ovate to suborbicular, 0.7–1 mm. long; petals yellow-brown, cream, or red, glabrous to densely appressed-pubescent abaxially, glabrous to subvillous at about the middle adaxially, elliptic-oblong, 3–4.5 mm. long; stamens declinate, 2.2–3.6 mm. long, filaments pilose subapically or (rarely) glabrate, anthers dorsifixed, obtuse, 0.7–1 mm. long; staminodes 0.7–1.8 mm. long; disc 0.7–1.3 mm. high; gynoecium about 2 mm. high and about 1.5 mm. wide, ovules 3 on each side of the placentae. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic to elliptic-oblong, 9–21 cm. long; exocarp drying light to dark brown, densely and minutely pubescent to glabrate, muricate, the excrescences thin and flattened laterally or thick and conical, 5–8 mm. long; endocarp reddish brown or cream. Seeds 3 on each side of the dissepiments, winged at both ends, 5–8.5 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATION. RUMPHIUS, G. E., *ibid.*

DISTRIBUTION. Ceram and Tanimbar Islands in the Moluccas eastward throughout New Guinea; rain forests from sea level to 1700 meters. See MAP 3.

Moluccas. CERAM: without definite locality, DeVriese & Teysmann, 1859–1860 (L-neotype of *Flindersia amboinensis* Poir.), NIFS bb 25869 (L). TANIMBAR ISLANDS: Otimmer, NIFS bb 24346 (L). West New Guinea (West Irian) and neighboring islands. AROE ISLANDS: Watoebaker Island, Dosimanalaoe, NIFS bb 25298 (L), NIFS bb 25322 (L); Trangan Island, Ngaibor, NIFS bb 25443 (L). WAIGEO ISLAND: E bank of Majalibit Bay 8 km. NE of Waifor, van Royen 5165 (CANB, L). SALAWATI ISLAND: Kaloal, Koster BW 1495 (L). JAPEN ISLAND: Seroei Aisaoe, Sebosiari, Iwanggin BW 10054 (L); Seroei,





MAP 3. Distributions of *Flindersia amboinensis* Poir. (dots) and *F. acuminata* C. T. White (half-filled circles).

Mariattoe, *NIFS bb* 30424 (L). VOGELKOP DIVISION: Sorong, *van Royen* 3505 (A, BRI, K, L, LAE); Warsamson Valley, E of Sorong, *Iwanggin BW* 5643 (L), *Moll BW* 11623 (L, LAE); Kebar Valley, *Koster BW* 7116 (L), *Schram BW* 7805 (L); Sidei, *Iwanggin BW* 5780 (L, LAE), *Koster BW* 4433 (BO, CANB, L, LAE), *BW* 4470 (CANB, L, LAE), *BW* 4474 (L), *BW* 4497 (CANB, L, LAE), *BW* 7062 (CANB, L, LAE); Wariki, ca. 50 km. W of Manokwari, *Schram BW* 7615 (L); Masni Plain, *Koster BW* 11059 (L, LAE), *Schram BW* 1813 (CANB, L), *Versteegh BW* 10444 (L); 8 km. NW of Manokwari, *Koster BW* 4350 (CANB, L, LAE); Lower Pami River, ca. 5 km. N of Manokwari, *Koster BW* 4359 (BO, CANB, L, LAE), *BW* 4388 (CANB, L), *BW* 4395 (L); Oesaibi, near Andai, SW of Manokwari, *Koster BW* 11890 (L, LAE); Momi, *Kostermans* 321 (L), 337 (L), 348 (L); Wariap, *Kostermans* 481 (L); Inanwatan, Moetoeri (Steenkool), *NIFS bb* 32680 (L). HOLLANDIA DIVISION: Hollandia, *Schram BW* 1678 (CANB, L). SOUTHERN DIVISION: Opka, ca. 10 km. NE of Ninati, Subdivision Moejoe, *Kalkman BW* 6454 (CANB, L, LAE). Territory of New Guinea. SEPIK DISTRICT: Wewak-Angoram Area, ca. 3 miles E of Urimo, *Saunders* 975 (CANB, LAE); 3 miles N of Angoram, *Pullen* 1882 (A, L, LAE); without definite locality, *Ledermann* 10406 (L). MADANG DISTRICT: Usino, *Henty NGF* 27500 (K, LAE), *Hoogland* 5035 (A, BM, BRI, K, L, LAE, US). MOROBE DISTRICT: Oomsis Creek, ca. 18 miles W of Lae, *Hartley* 10516 (A, LAE), *Smith & Mair NGF* 1253 (LAE); Bulolo, *McViegh & Ridgwell NGF* 7337 (A, BO, BRI, L, LAE, NSW 99666); Lower Taun Creek, near Bulolo, *Havel & Henry NGF* 17026 (K, L, LAE, NSW 99664), *Havel & Kairo NGF* 15441 (LAE); Crooked Creek, near Bulolo, *Dobson & Havel NGF* 9116 (LAE). Papua. WESTERN DISTRICT: Lake Daviumbu, Middle Fly River, *Brass* 7517 (A, BRI, L, LAE); Lower Fly River, E bank opposite Sturt Island, *Brass* 8032 (A); Upper Wassi Kussa River, *Brass* 8634 (A, BRI, L, LAE); Oriomo River, *Hart NGF* 5018 (BO, CANB, L, LAE, NSW 99661), *White & Gray NGF* 10366 (A, BO, BRI, K, L, LAE, NSW 99662).



SOUTHERN HIGHLANDS DISTRICT: Lake Kutubu Patrol Post, *Saunders 1079* (CANB, L, LAE). GULF DISTRICT: Kikori Subdistrict, Seribi River, near Mid-dletown, *Gray & Floyd NGF 8068* (BRI, LAE). CENTRAL DISTRICT: between Okaka and Mafula, *White*, August 1918 (BRI); Kubuna, *Brass 5565* (A, NY); Brown River, *Allan & Jones NGF 2751* (BRI, CANB, L, LAE); near Karema, Brown River, *Schodde 2496* (A, K, L, LAE); Brown River Forest Reserve, Omari Creek, *McDonald NGF 8226* (BO, BRI, K, L, LAE, NSW 99665); Sogeri, *Forbes 421* (BM), *Heather NGF 2828* (BRI, L, LAE); near Rigo, *Schodde 2806* (A, BO, K, L, LAE, NSW 99663); Owen Stanley Range, *Lane-Poole 362* (BRI-holotype of *Flindersia macrocarpa* Lane-Poole ex White & Francis; K-isotype). NORTHERN DISTRICT: Yodda River, *Carr 13913* (A); Dobodura Area, *NGF 2063* (LAE); ca. 1 km. W of Popondetta, *Hoogland 3737A* (CANB, LAE); Managalase Area, S side of Hydrographers Range near Siurane, *Pullen 5584* (CANB). Cultivated. Java. Botanic Gardens, Bogor, *Anonymous*, January 1890 (BO, L).

Not, as the specific epithet implies, known from Ambon Island. In the original description in *Herbarium Amboinense* Rumphius gave Ceram as the locality.

As delimited here, this is probably the most variable species in the genus. Among the variable features are:

1. Petals glabrous to densely appressed-pubescent abaxially.
2. Petals glabrous to subvillous adaxially.
3. Stamens 2.2–3.6 mm. long.
4. Filaments glabrate to pilose subapically.
5. Capsules 9–21 cm. long.
6. Exocarp of capsule glabrate to minutely pubescent.
7. Excrescences of exocarp flattened laterally or thick-conical.
8. Endocarp reddish brown or cream colored.

I have not been able to find sufficient correlations among these characters to recognize more than a single taxon. The color of the endocarp, for example, does not always correlate with the pubescence of the exocarp and neither of these characters consistently correlate with the shape of the excrescences or the size of the capsule. In the flowers, the only tendency toward correlation is between petal pubescence and stamen length. Perhaps some definite correlations could be made if flowering and fruiting material could be studied for each variant. Where I have been able to do this, however, studying flowering and fruiting collections that were obviously the same morphologic type, it has seemed unlikely. Finally, it should be noted that each of the variable features of this species was found to be variable in one or more of the other species of the genus as well.

*Flindersia macrocarpa*, originally described as having larger capsules than had previously been attributed to any other species of the genus, now grades into typical *F. amboinensis*.

Obviously very closely related to *Flindersia acuminata*, which differs mainly in having smaller leaves, narrower, more acuminate leaflets, and shorter stamens. Neither of these species appears to be very closely related to any of the other species of the genus.



Flowers that were apparently insect-stung were noted in several collections. They are atypical in having enlarged, almost cartilaginous petals, filaments, staminodes, and ovaries. Remains of insect larvae were found in the ovaries of some of the affected flowers.

7. *Flindersia acuminata* C. T. White, Queensl. Dept. Agr. Bot. Bull. 21: 5. t. 2. 1919. Type: *Mocatta*, July 3, 1915, Queensland, Atherton.

Small to rather large trees to 33 m.; outer bark brownish, with shallow longitudinal fissures; inner bark brownish grading to yellowish brown or cream toward the cambium; sapwood whitish; heartwood yellowish; branchlets, leaves, and inflorescences glabrous to pubescent with mostly minute, predominantly stellate trichomes. Leaves alternate, imparipinnate or (occasional leaves) paripinnate, 12.5–35 cm. long; rachis glabrous to finely pubescent; petiolules of lateral leaflets 4–10 mm. long; terminal leaflet on an extension of the rachis 1–3.1 cm. long; leaflets 3–5 pairs, chartaceous to subcoriaceous, sparsely to densely pellucid-dotted, glabrous to loosely pubescent below, glabrous or short-pubescent along the midrib above, elliptic to elliptic-lanceolate, usually unequal-sided and often subfalcate, 5–15 cm. long, 1.3–4.8 cm. wide, base acute to rounded, often oblique, main veins 10–17 on each side of the midrib, apex narrowly long-tapering to short and bluntly acuminate. Inflorescence terminal, 7–14 cm. long, usually about as wide as long, axes and branches short-pubescent. Flowers bisexual, 3–4 mm. long; pedicels 0.7–1 mm. long; sepals sparsely appressed-pubescent, ciliolate, suborbicular, 1–1.2 mm. long; petals creamy yellow, sparsely appressed-pubescent abaxially, glabrous or with a few papillae adaxially, elliptic-oblong, 3–3.2 mm. long; stamens inflexed apically, 1.5–2 mm. long, filaments glabrous, anthers basifixed, broadly rounded apically, about 0.5 mm. long; staminodes about 1 mm. long; disc about 1 mm. high; gynoecium about 1.5 mm. high and about 1 mm. wide, ovules 3 on each side of the placentae. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic-oblong, 9–12 cm. long; exocarp drying light to dark brown, densely and minutely pubescent to glabrate, muricate, the excrescences thick and conical, to 5 mm. long; endocarp very pale brown flecked with medium brown. Seeds 3 on each side of the dissepiments, winged at both ends, 5 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. WHITE, C. T., *ibid.* FRANCIS, W. D., Australian Rainforest Trees 427. 1951.

DISTRIBUTION. Cook District, Queensland; well-drained rain forests. See MAP 3.

Queensland. COOK DISTRICT: Kuranda, *Crothers*, January 1926 (BRI); Forestry Reserve 607 ca. 10 miles W of Cairns, *Smith 10121* (BRI), *Draper* (BRI); Tinaroo Range ca. 15 miles NE of Atherton, *Smith & Webb 3372* (BRI);



Atherton, *Mocatta*, July 3, 1915 (BRI-holotype; MEL-isotype), *Mocatta* (BRI, MEL), *Jones 1284* (CANB); Gadgarra, *Barnard 31* (CANB), *Dreghorn 11* (BRI), *20E* (BRI), *Smith 10144* (BRI), *10155* (BRI), *10424* (BRI), *Volk 1411* (BRI), *Webb 1661* (CANB), *White 1567* (BRI); Innisfail, *Michael 403* (A, BRI); head of Johnstone River, *White*, January 1918 (BRI). Without definite locality: *Wood Technology Dept. Queensland Forestry Service 56* (NY).

8. *Flindersia schottiana* F. Muell. Frag. Phytogr. Austral. 3: 25. 1862.  
Lectotype: *Bidwill 95*, Queensland, Wide Bay.

*Flindersia schottiana* F. Muell. var. *pubescens* F. Muell. Frag. Phytogr. Austral. 5: 143. 1866. Type: *Anonymous*, Queensland, Rockingham Bay.

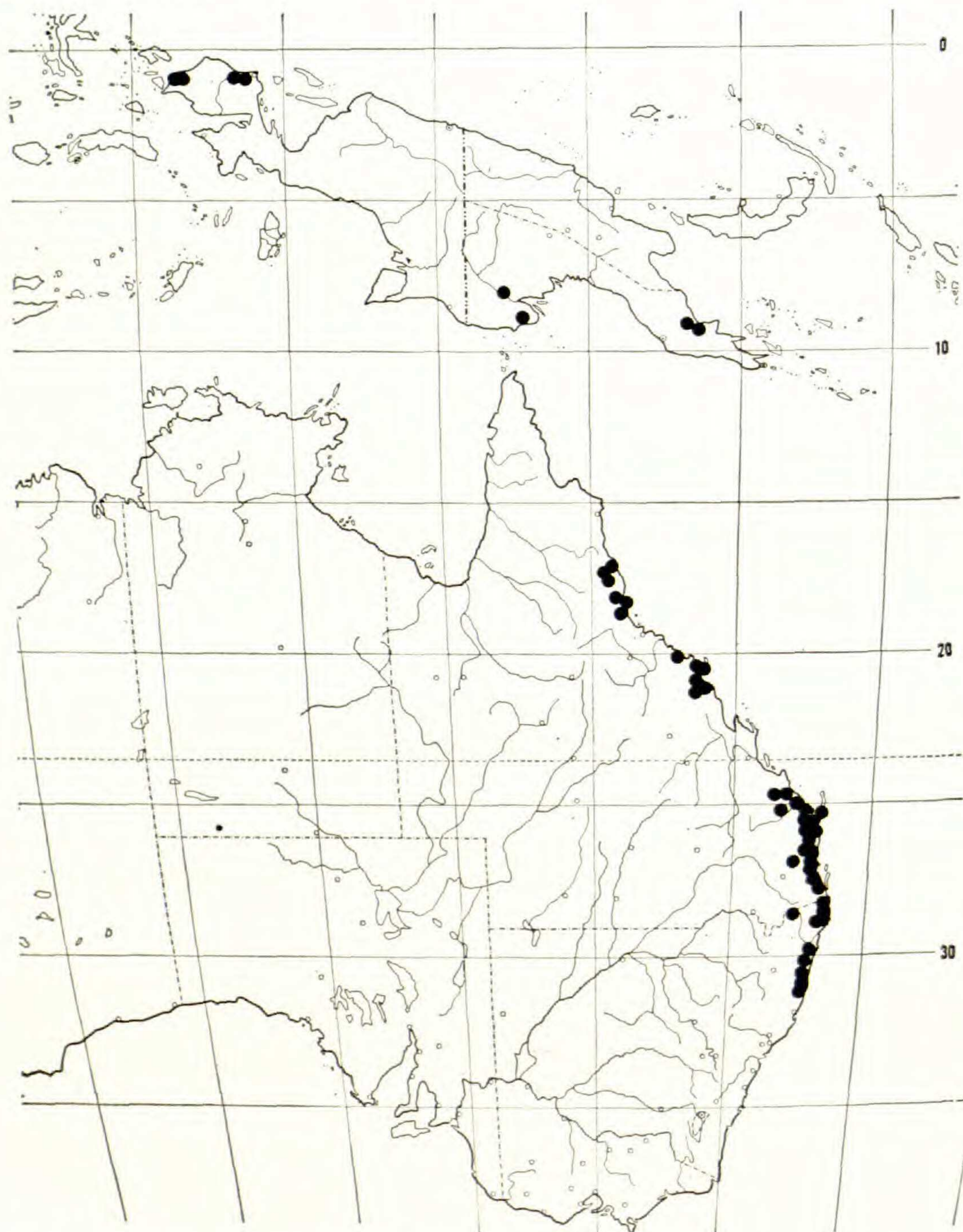
*Flindersia pubescens* F. M. Bailey, Queensl. Agr. Jour. 3: 353. 1898. Type: *F. M. Bailey*, October 23, 1883, Queensland, Brisbane (cultivated).

Large trees to 50 m.; outer bark pale brown or gray, generally quite smooth; inner bark white grading to light brown or yellow-brown toward the cambium; sapwood pale yellow; heartwood light brown; branchlets, leaves, and inflorescences glabrous to pubescent with predominantly stellate, usually rust-colored trichomes. Leaves opposite, imparipinnate or (occasional leaves) paripinnate, 19–54 cm. long (the leaves of immature trees generally much larger); rachis glabrate to appressed- or soft-pubescent; petiolules of lateral leaflets usually obsolete, occasionally to 2.5 mm. long, terminal leaflet on an extension of the rachis 1.1–2.7 cm. long; leaflets (4–)5–8 pairs, chartaceous to subcoriaceous, densely pellucid-dotted, glabrate to appressed- or soft-pubescent below, glabrous or short-pubescent along the midrib above, narrowly elliptic to oblong, usually unequal-sided and often falcate, 8–22 cm. long, 1.6–6.3 cm. wide, bases of lateral leaflets narrowly to broadly rounded to cordate oblique, base of terminal leaflet acute to cuneate, main veins 15–22 on each side of the midrib, apex gradually tapering to subacuminate. Inflorescence terminal, to 40 cm. long, generally much wider than long, axes and branches appressed- to soft-pubescent. Flowers bisexual, 4–6 mm. long; pedicels obsolete to 1 mm. long; sepals minutely appressed-pubescent, ciliolate, broadly ovate to suborbicular, 1–1.5 mm. long; petals white, sparsely appressed-pubescent abaxially, villous in the basal one-third to one-half adaxially, elliptic-oblong, 4–6 mm. long; stamens declinate, about 3 mm. long, filaments pilose subapically or (rarely) glabrous, anthers basifixed, bluntly mucronulate, about 1 mm. long; staminodes 1–1.7 mm. long; disc about 1.5 mm. high; gynoecium 2–2.8 mm. high, about 1.5 mm. wide, ovules 3 on each side of the placentae. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic to elliptic-oblong, 8–13 cm. long; exocarp drying brown, glabrate to minutely and densely pubescent, muricate, the excrescences rather thick and conical, to 5 mm. long; endocarp reddish brown to light brown. Seeds 3 on each side of the dissepiments, winged at both ends, 5–6 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. BAILEY, F. M., Comprehensive Cat. Queensl. Pl. Pl.



IV. 1913 (as *Flindersia pubescens*). FRANCIS, W. D., Australian Rain-forest Trees 161, 162, 163. 1929; 179, 180, 181, 427 (as *F. pubescens*), 430 (as *F. pubescens*). 1951. MAIDEN, J. H., Forest Fl. New S. Wales 2: t. 69 & 70. 1905.



MAP 4. Distribution of *Flindersia schottiana* F. Muell.

DISTRIBUTION. New Guinea and eastern Australia south to the Hastings River, New South Wales; rain forests to 700 meters. See MAP 4.

West New Guinea (West Irian). VOGELKOP DIVISION: Sorong, Rmoe, *Pleyte* 703 (L); Sorong, near Kp. Baroe, *Pleyte* 737 (BO, L); Mlasoen Hill E of So-



rong, *van Royen* 3406 (A, L, LAE); Warsamson Valley E of Sorong, *Schram* BW 12354 (L, LAE); Kebar Valley, *Koster* BW 7121 (L), *Moll* BW 9531 (L, LAE), *Schram* BW 7921 (L); Sidai, *Schram* BW 1752 (CANB, L), BW 1756 (L), BW 7607 (L). **Papua.** WESTERN DISTRICT: Lower Fly River, E bank opposite Sturt Island, *Brass* 7991 (A, BRI, L, LAE); Oriomo Creek, mouth of Yakup Creek, 40 miles from sea, *Womersley* NGF 17729 (A, BO, K, L, LAE, NSW 99681). NORTHERN DISTRICT: Bariji-Managalase Area, N side of Sibium Range S of Toma Village, *Pullen* 6383 (CANB, L, LAE); 2 miles from Mafo along Ibinamo River toward Mt. Suckling, *Darbyshire* 1164 (A, L, LAE, NSW 99603). **Queensland.** COOK DISTRICT: Cairns, *Bailey* (NSW 99606), *Betche*, August 1901 (NSW 99609, MEL); Trinity Bay, *Hill*, 1876 (BRI, MEL); Rocky Creek, Atherton District, *Bailey*, June 29, 1899 (BRI); Martintown, *Bailey*, June-July 1899 (BRI, MEL); Forest Reserve 185, Juara Creek, near Danbulla, *Fraser* 19 (BRI), *Smith* 3781 (BRI); Danbulla, *Jones & Pedley* 669 (CANB); Kairi, *White*, January 24, 1918 (BRI); Atherton District, *Mocatta* (BRI, MEL); Forestry Reserve 191, Barron, Wongabel, *Forestry Department* 1 (BRI), 2 (BRI), 3 (BRI, K). NORTH KENNEDY DISTRICT: Rockingham Bay, *Anonymous* (MEL-holotype of *Flindersia schottiana* F. Muell. var. *pubescens* F. Muell.; BO, BRI, GH-isotypes); Pioneer Creek, *Griffiths* (MEL, NSW 99608); Hinchinbrook Island, *Anonymous* (BRI, MEL); Port Denison, *Fitzalan* (BRI, MEL), *Anonymous* (MEL). SOUTH KENNEDY DISTRICT: Cumberland Islands, *Anonymous* (BRI, MEL); Mount Dryander, *Kilner & Fitzalan* (BM, MEL); Dalrymple Heights and vicinity, *Clemens*, June-November 1947 (A, BRI), September-November 1947 (GH, MEL, MICH), November 1947 (GH, MICH); Eungella Range, via Mackay, *Francis*, October 3-12, 1922 (BRI); Cape Hillsborough, ca. 15 miles NW of Mackay, *Bardsley*, November 8, 1967 (BRI). PORT CURTIS DISTRICT: Kalpower, *Floyd*, September 5, 1949 (LAE); Baffle Creek District, *White*, April 1920 (BRI). BURNETT DISTRICT: Mt. Perry, *Forestry Department*, October 1921 (BRI). WIDE BAY DISTRICT: near the Hummock, a few miles E of Bundaberg, *Smith* 4100 (BRI), 4101 (BRI); Bingera, ca. 10 miles WSW of Bundaberg, *Smith* 4125 (BRI); Dundowran, at Saw Mill Scrub, *Tryon*, July, 1928 (BRI); Maryborough District, near Granville Bridge, *Clemens*, November 9, 1948 (BRI, GH, MICH); Wide Bay, *Bidwill* 95 (K-lectotype of *Flindersia schottiana* F. Muell.); Fraser Island, *Petrie* 31 (BRI); Bauple, *Clemens*, June 13, 1945 (GH), June 10-20, 1945 (MICH); Amamoor, *Moore* in *Swain* 337 (BRI); Kin Kin, *Francis*, May 1919 (BRI); Imbil, *Epps*, August 1914 (BRI), *Webb* 5019 (CANB); Brooloo, *Webb* SN 5339 (CANB), 1635 (CANB). MORETON DISTRICT: Parish of Monsidale, *Webb* SN 5422d (CANB); Eumundi, 5 miles S of Cooroy, *Bailey & Simmonds*, November 1894 (BRI); Blackall Range, *Twine*, February 1918 (BRI), *White*, April 1918 (BRI); Sawpid Range, *White*, April 1918 (BRI); Norman Creek, Brisbane River, *Cunningham*, 1828-1829 (K); Enoggera Creek, *Bailey* 10 (NSW 99611); Three-mile Scrub, near Brisbane, *Shirley* (BRI); Ithaca Creek, Simpson's Scrub Road, *White*, January 1918 (BRI); Brisbane, *Bailey* (NSW 99610); Moreton Bay, *Oldfield* (K); Burleigh Hts., *White*, December 1917 (BRI). Without definite locality: *Wood Technology Dept. Queensland Forest Service* 78 (NY), 87 (NY). **New South Wales.** Acacia Creek, via Killarney, Queensland, *Dunn*, June 1905 (NSW 99598); Murwillumbah, *Campbell*, January 1904 (NSW 99600); 5 miles S of Brunswick Heads, *Gray & Gray* 3915 (CANB); Potts Point, *Robbins* 2612 (CANB); Byron Bay Lighthouse Road, *Constable* 6505 (NSW 83976); Richmond River, *Henderson*, November 1886 (MEL, NSW 99597); Clarence and Richmond (rivers), *Northern Woods New South Wales* 24 (K, MEL); Whian Whian, *Jones* 469 (CANB), 939 (CANB); Casino,



*District Forester*, December 1, 1905 (BRI, NSW 99594), *McAuliffe* 8338/12 (NSW 99593, US); Tintenbar, *Baeuerlen* 633 (BM, MICH, NSW 99602); Clarence River, *Anonymous* (MEL), *Moore* 137 (MEL), *Northern Woods New South Wales* 61 (K, MEL), *Selwyn* (MEL); Clarence River, Grafton, *Northern Woods New South Wales* 63 (NSW 99604), *Squire*, November 1937 (NSW 99595); Mt. Yarrahappini, *Briggs* 70.05F (NSW 99601), *Smith* 2 (NSW 99592); lower slopes of Dorrigo Range, *Wheen*, August 29, 1945 (NSW 99596); Taylor's Arm, *Wilshire*, June 2, 1905 (NSW 99605); Bellinger and McLeay Rivers, *Anonymous* (K); McLeay River, *MacDonald* 183 (MEL), *Woolls* (MEL); Kempsey, *MacDonald* 212 (MEL), *Rudder*, May 17, 1891 (NSW 99591); Hastings River, *Tozer* (*Thozet?*) (NSW 99599). Cultivated. Java. Bogor Botanic Gardens, *Anonymous*, 1903 (US). Queensland. COOK DISTRICT: Forestry Reserve 310, Gadgarra, *Smith* 10824 (BRI). BURKE DISTRICT: Mt. Isa, *Pedley* 1060 (BRI). PORT CURTIS DISTRICT: Rockhampton Botanic Gardens, *Simmons* 4 (BRI). MORETON DISTRICT: Brisbane Botanic Gardens, *Bailey* (BRI), *Blake* 2688 (BRI), *White* (BRI); Kangaroo Point, Brisbane, *Francis* (BO), *White*, November 1912 (BRI); Wickham Reserve, Brisbane, *Bailey*, October 23, 1883 (BRI-holotype of *Flindersia pubescens* F. M. Bailey). New South Wales. Sydney Botanic Gardens, *Boorman*, December 1908 (P).

*Flindersia pubescens* is apparently recognized as a distinct species by many Australian botanists. It is considered to have a rather limited distribution centering on the Cairns area in northeast Queensland whereas *F. schottiana*, *sensu stricto*, is considered to be wider ranging, extending from New Guinea and north Queensland south to the Hastings River in New South Wales. The morphologic differences between the two are given in the following key from White (1921):

- Leaflets on flowering shoots subcoriaceous, somewhat falcate, 6.5–13 cm. long, 2–3.3 cm. broad, quite glabrous on the rachis and under surface clothed with very close and dense stellate, velvety tomentum, veins and veinlets not prominent and often scarcely discernible. . . . . *F. schottiana*  
 Leaflets on the flowering branches chartaceous, 12.5–23 cm. long, 4.5–6.5 cm. broad, rachis densely clothed with comparatively long golden-brown stellate hairs, under surface clothed with numerous but more or less scattered stellate hairs, the veins and veinlets prominent . . . . . *F. pubescens*

After studying a large number of collections from both Australia and New Guinea I am convinced that the differences between these two taxa all break down to a greater or lesser degree and that they represent environmental adaptations of sub-taxonomic significance. Their geographic distributions tend to substantiate this, I think, since both forms occur at widely disjunct localities in New Guinea. For example, *Brass* 7991, from the Fly River and *Pleyte* 737, from the Vogelkop Peninsula, are good matches for typical *F. schottiana*, whereas *Darbyshire* 1164, from the Northern District of Papua, and *Schram* BW 12354, from the Vogelkop Peninsula, are typical of *F. pubescens*.

As indicated above, in the outline to species relationships, *Flindersia schottiana*, *F. bourjotiana*, and *F. xanthoxyla* appear to be more closely related to one another than to any of the other species of the genus. Beyond this, however, the three are mutually quite distinct.



9. *Flindersia bourjotiana* F. Muell. Frag. Phytogr. Austral. 9: 133. 1875. Type: *Dallachy*, Queensland, Rockingham Bay.

*Flindersia tysoni* C. DC. Bull. Herb. Boiss. ser. 2. 6: 986. 1906. Type: *Tryon*, August 1901, Queensland, Mossman River.

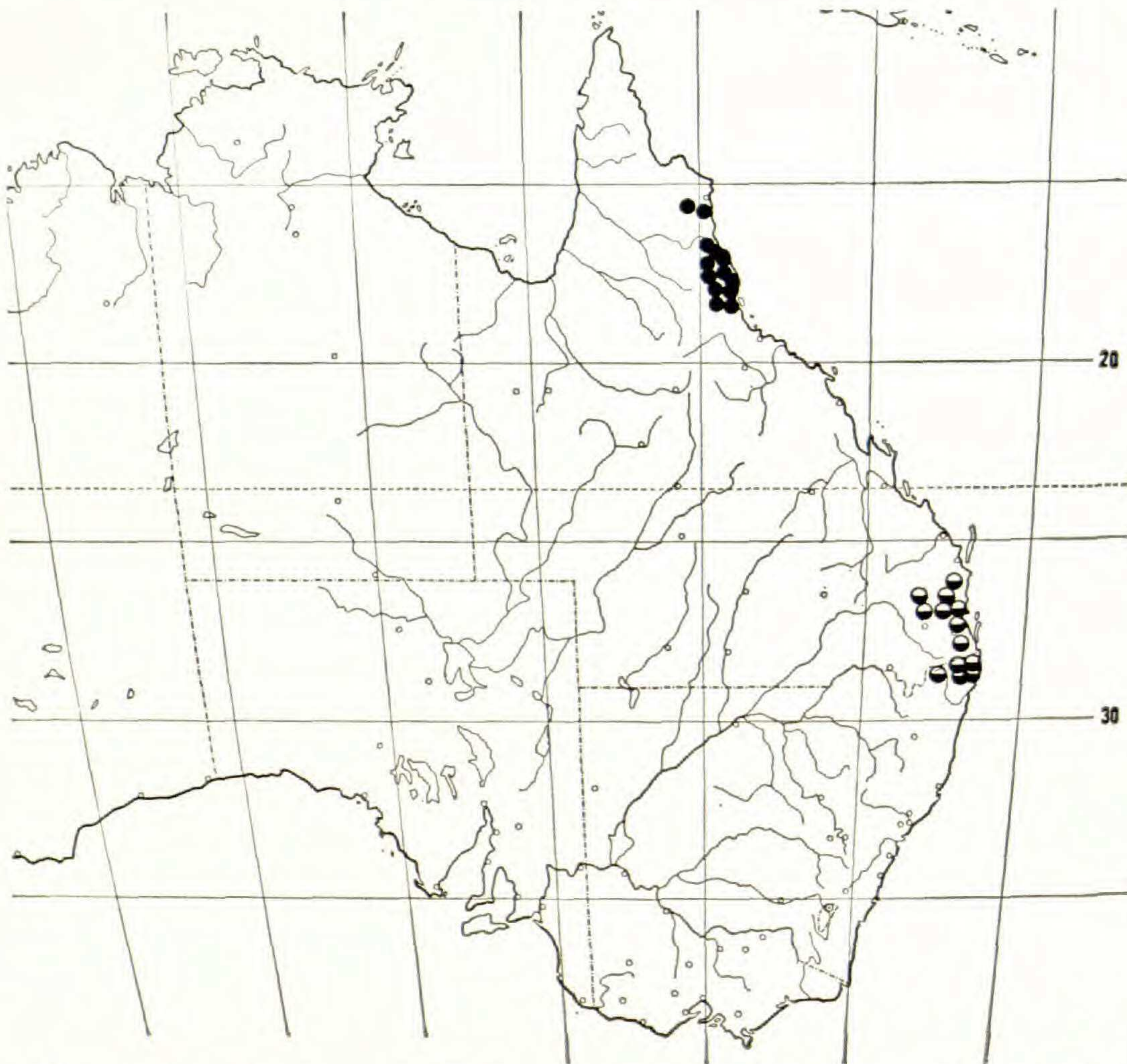
Large trees to 35 m.; outer bark gray or brown, rather smooth; inner bark pale yellow-brown; sapwood whitish; heartwood pale yellow-brown; branchlets, leaves, and inflorescences glabrous to pubescent with mostly minute, predominantly stellate trichomes. Leaves opposite, imparipinnate or (occasional leaves) paripinnate, 9–33 cm. long; rachis glabrate to appressed- or velvety-pubescent; petiolules of lateral leaflets 1.5–4 mm. long, terminal leaflet on an extension of the rachis 1–2 cm. long; leaflets (1–)2–4 pairs, chartaceous to subcoriaceous, densely pellucid-dotted, glabrous to rather densely short-pubescent below, glabrous to sparsely appressed-pubescent above, elliptic to lanceolate, equal- or only slightly unequal-sided, 5.5–17 cm. long, 1.5–4.8 cm. wide, base acute to obtuse, main veins 12–17 on each side of the midrib, apex obtuse to acute or occasionally bluntly acuminate. Inflorescence terminal, to 20 cm. long, generally much wider than long, axes and branches sparsely to rather densely short-pubescent. Flowers bisexual or (a few to many flowers in an inflorescence) functionally staminate, 6–10 mm. long; pedicels obsolete to 1 mm. long; sepals glabrate to sparsely appressed-pubescent, ciliolate, broadly ovate to suborbicular, 1–2 mm. long; petals white or greenish white, sparsely appressed-pubescent abaxially, glabrous adaxially, elliptic, 5–9.5 mm. long; stamens declinate, 4–5.7 mm. long, filaments sparsely to rather densely pilose subapically, anthers dorsifixed, mucronate, 1–1.2 mm. long; staminodes 1–2 mm. long; disc thin in bisexual flowers and comparatively thick in functionally staminate flowers, 1–1.5 mm. high; gynoecium in bisexual flowers 2–3 mm. high, about 1.5 mm. wide, ovules 3 on each side of the placentae; gynoecium in functionally staminate flowers poorly differentiated, narrowly conical, about 1 mm. high, without ovules. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic, 7–15 cm. long; exocarp drying blackish-reddish brown, glabrous, muricate, excrescences slender, often recurved, to 4 mm. long; endocarp light brown. Seeds 3 on each side of the dissepiments, winged at both ends, about 5.5 cm. long; hypocotyl lateral, ascending.

ILLUSTRATION. FRANCIS, W. D., Australian Rain-forest Trees 426. 1951.

DISTRIBUTION. Northeast Queensland, Cook and North Kennedy Districts; rain forests to 900 meters. See MAP 5.

Queensland. COOK DISTRICT: Mossman River, *Tryon*, August 1901 (BRI, NSW-isotypes of *Flindersia tysoni* C. DC.); near Ayton, *Gittons* 575 (BRI 35658); Bailey's Creek Area, *Smith* 11556 (BRI); Mt. Lewis, ca. 10 miles N of Mt. Malloy, *Schodde* 3326 (CANB); Kuranda, *DuRietz*, August 1927 (BRI); Atherton, *Curry* 5 (NY), *Jones* 1289A (CANB), 1289B (CANB), *Mitchell*, August 1911 (NSW 99683), *Tardent* X230 (BRI), *Webb* 2502 (CANB); Atherton Table-





MAP 5. Distributions of *Flindersia bourjotiana* F. Muell. (dots) and *F. xanthoxyla* (A. Cunn. ex Hook.) Domin (half-filled circles).

land, *Tardent* (A, BRI); Danbulla, *Fraser* 22 (BRI), *Webb* 5131 (CANB); Gadgarra, *Dreghorn* 12 (BRI), *Kajewski* 1140 (A, BM, BRI, NY, US), *Trist* 33 (NY); Lake Barrine, *Barnard*, June 15, 1941 (CANB); Glenallan, Malanda, *Tardent* 188 (BRI); Ravenshoe, *Manuell* 31 (K); Russel River, *Anonymous* (MEL); Innisfail, *Michael* 132 (GH), *Petrie* (A); Johnstone River, *Bancroft*, 1885–1886 (BRI, MEL), *Michael*, May 1916 (BRI); Bingil Bay Road, *Gittons* 575 (BRI 35542); Etty Bay, *Webb* 905 (CANB). NORTH KENNEDY DISTRICT: Herberton, *Mocatta*, February 1917 (BRI); Kirrama Range W of Kennedy, between Society Flat and Yuccabine Creek, *Smith* 3205 (BRI); Murray River, *Anonymous*, December 12, 1861 (MEL); Rockingham Bay, *Dallachy* (MEL-holotype of *Flindersia bourjotiana* F. Muell.; BO, MEL-isotypes).

*Flindersia tysoni* was previously placed in the synonymy of *F. bourjotiana* by White (1921).

10. *Flindersia xanthoxyla* (A. Cunn. ex Hook.) Domin, *Bibliot. Bot.* 22 (89): 298. 1927.

*Oxleya xanthoxyla* A. Cunn. ex Hook. in Hooker's *Bot. Misc.* 1: 246. *t.* 54. 1830. Type: *Cunningham* 117, Queensland, Brisbane River.



*Flindersia oxleyana* F. Muell. Frag. Phytogr. Austral. 1: 65. 1859 (*nomen illegit.*, based on *Oxleya xanthoxyla* A. Cunn. ex Hook.).

Medium to large trees to 40 m.; outer bark gray or gray-brown, fairly smooth; wood yellow; branchlets, leaves, and inflorescences glabrous to pubescent with mostly minute, predominantly stellate trichomes. Leaves opposite, imparipinnate, 15–32 cm. long; rachis glabrous to appressed- or short-pubescent; petiolules of lateral leaflets obsolete to 6 mm. long, terminal leaflet on an extension of the rachis 0.8–2.8 cm. long; leaflets (2–)3–5 pairs, membranaceous to chartaceous, very brittle when dry, with or without scattered pellucid dots, glabrous to appressed- or soft-pubescent below, glabrous to sparsely appressed-pubescent above, elliptic to lanceolate, usually unequal-sided and often falcate, (2.2–)4–13 cm. long, (0.6–)1.3–3.2 cm. wide, base obtuse to cuneate, often oblique in lateral leaflets, main veins 11–15 on each side of the midrib, apex long-tapering, acute. Inflorescence terminal, to 25 cm. long, usually much wider than long, axes and branches appressed- to short-pubescent. Flowers bisexual, 4–5 mm. long; pedicels obsolete to 2 mm. long; sepals glabrous to sparsely appressed-pubescent basally, ciliate, broadly ovate, about 1 mm. long; petals pale yellow, glabrous, elliptic-oblong, about 4.3 mm. long; stamens declinate (becoming straight after anthesis), about 3 mm. long, filaments sparsely pilose subapically, anthers dorsifixed, obtuse apically, about 1 mm. long; staminodes about 1.3 mm. long; disc 0.7–1.2 mm. high; gynoecium 1.5 mm. high, about 1 mm. wide, ovules 3 on each side of the placentae. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic-oblong, 6.5–11 cm. long; exocarp drying dark brown to pale gray-brown, densely and minutely pubescent, muricate, excrescences rather narrowly conical, unequal in length, to 4 mm. long; endocarp yellow-brown. Seeds (2–)3 on each side of the dissepiments, winged at both ends, 3.3–5 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. CUNNINGHAM, A., *ibid.* FRANCIS, W. D., Australian Rain-forest Trees 164, 165. 1929 (as *Flindersia oxleyana*); 184, 185. 1951. MAIDEN, J. H., Forest Fl. New S. Wales 2: t. 73 & 74. 1906 (as *F. oxleyana*).

DISTRIBUTION. Southeast Queensland and adjacent New South Wales; rain forests to 500 meters. See MAP 5.

Queensland. BURNETT DISTRICT: Edenvale Hill, near Kingaroy, *Michael* 3106 (BRI). WIDE BAY DISTRICT: Mary River Scrub, Gympie, *Kenny* (BRI); Imbil, *McAdam* 83 (BRI, NY), 85 (A, BRI), 87 (BRI, NY), *Weatherhead*, July 1917 (BRI). MORETON DISTRICT: Parish of Monsidale, *Webb* SN 5422c (CANB); Yarraman, *Clemens*, August 4–15, 1944 (A, NY), *Floyd*, August 29, 1949 (LAE), *Webb* 5143 (CANB), SN 5337 (CANB); South Pine River near Samford, *Hubbard* 5941 (A, BRI, K); South Pine River near Bald Hills, *White* 7155 (A, BO, NY); Samford Range, *Shirley & White*, April 1918 (BRI); Samford, *Tracey* in *Webb & Tracey* 3392 (CANB); Petrie, *Blake* 3079 (BRI); Enoggera, *Bailey* (NSW 99643); Three-mile Scrub, Enoggera Creek, *Bancroft* (BRI); Brisbane River below Breakfast Creek Bridge, *Bailey* (BRI, NSW 96644); Brisbane River,



*Cunningham* 109 (GH), 117 (BM-holotype of *Oxleya xanthoxyla* A. Cunn. ex Hook.; K-isotype), *Hill* (MEL); Sherwood, Brisbane River, *Hubbard* 5942 (K), *Anonymous*, December 18, 1930 (BRI); Tamborine Mountain, *Longman & White*, February 1917 (BRI). Without definite locality: *Wood Technology Dept. Queensland Forest Service* 80 (NY). **New South Wales.** Acacia Creek via Killarney, Queensland, *Boorman*, February 1905 (NSW 99639), *Dunn*, November 1905 (NSW 99642), *Dunn* 252 (NSW 99640); Tweed River, *Anonymous* 59 (MEL), *Moore* 14125 (BM); Murwillumbah, *Charles*, January 9, 1905 (NSW 96649); Whian Whian, *Jones* 943 (CANB), *Webb* 2457 (CANB), 5241 (CANB), *White* 12769 (BRI); Wollongbar Experimental Farm, Lismore, *Johnson & Constable*, June 11, 1957 (NSW 96650); Tintenbar, *Baeuerlen*, March 1892 (A); Richmond River, *Fawcett* (MEL), *Henderson* (MEL), *Watts*, 1902 (NSW 99641); Richmond River to the Tweed River, *Moore* (BM, GH, K); Hastings River, *Boorman*, August 1907 (P); Sandiland Ranges, *Boorman*, November 1904 (NSW 96646). Without definite locality. *Leichhardt* (K, NSW 99638). Cultivated. **Queensland.** WIDE BAY DISTRICT: Gympie, Wickham and Channon Streets, *Kenny*, January 17, 1907 (BRI). **New South Wales.** Sydney Botanic Gardens, *Boorman*, February 1907 (NSW 96647), *Camfield*, January 1894 (NSW 96648), December 1896 (NY), January 1898 (MEL, US).

11. *Flindersia bennettiana* F. Muell. ex Benth. Fl. Austral. 1: 389. 1863. Lectotype: *Bidwill*, Queensland, Wide Bay.

*Flindersia leichhardtii* C. DC. Monogr. Phanerog. 1: 731. 1878. Type: *Leichhardt*, 1845, Queensland, Moreton Bay.

Small to large trees to 43 m.; outer bark pale gray, to reddish brown, quite smooth; inner bark whitish; branchlets, leaves, and inflorescences glabrous to minutely pubescent with stellate trichomes. Leaves opposite, imparipinnate, 8.5–36(–45) cm. long; rachis glabrous to appressed- or rarely short-pubescent; petiolules of lateral leaflets 1–6 mm. long, terminal leaflet on an extension of the rachis 0.9–3.5 cm. long; leaflets 1–3(–4) pairs, subcoriaceous to coriaceous, densely pellucid-dotted, glabrous or sparsely appressed-pubescent below, glabrous above, ovate to elliptic to elliptic-oblong, equal- or occasionally unequal-sided and subfalcate, 6–18.5 cm. long, 1.7–6.7 cm. wide, base obtuse to subacute, often slightly oblique, veins prominent above, main veins 10–30 on each side of the midrib, apex obtuse or occasionally acute. Inflorescence terminal or occasionally terminal and upper-axillary, to 25 cm. long, as wide or nearly as wide as long, axes and branches appressed- to short-pubescent. Flowers bisexual or (a few to many flowers in an inflorescence) functionally staminate, 3–6 mm. long; pedicels 0.3–3.5 mm. long; sepals sparsely to densely short-pubescent, ciliate, ovate, 1–1.5 mm. long; petals white, sparsely appressed-pubescent abaxially, glabrous adaxially, elliptic-oblong, 2.5–5 mm. long; stamens declinate, 2.5–4 mm. long, filaments glabrous, anthers dorsifixed, bluntly mucronulate, about 0.9 mm. long; staminodes 1–1.7 mm. long; disc about 1 mm. high; gynoecium in bisexual flowers 2–2.8 mm. high, about 2 mm. wide, ovules 2 on each side of the placenta; gynoecium in functionally staminate flowers poorly differentiated, conical, about 1 mm.



high, without ovules. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic to elliptic-oblong, 4–7 cm. long; exocarp drying medium to very dark reddish brown, glabrous, muricate, excrescences narrowly conical, unequal in length to 4 mm. long; endocarp reddish brown. Seeds 2 on each side of the dissepiments, winged at both ends, 3–4.3 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. FRANCIS, W. D., *Australian Rain-forest Trees* 168, 169. 1929; 186, 187. 1951. MAIDEN, J. H., *Forest Fl. New S. Wales* 3: t. 77 & 78. 1906.

DISTRIBUTION. Southeast Queensland and northeast New South Wales; rain forests to 300 meters.

Queensland. WIDE BAY DISTRICT: Fraser Island, *Epps* 30 (NY), *Forestry Dept.* 131 (BRI), 132 (BRI), 133 (BRI), *Hubbard* 4403 (K), *Petrie* 30 (BRI), *Trist* 6 (NY); Dundowran via Gympie, *Tryon*, July 1928 (BRI); Maryborough District, *Young*, September 1916 (BRI), Mt. Bauple, *Kajewski*, September 1922 (A, BRI); Wide Bay, *Bidwill* (K-lectotype of *Flindersia bennettiana* F. Muell. ex Benth.; GH, NY); Gympie, *Hamilton-Kenny* 145.05 (NSW 99582); Kin Kin, *Francis* (BRI, NSW 99586); Forest Survey Camp, Amamoor, *Anonymous*, April 22, 1919 (BRI); Imbil, *Floyd*, September 18, 1949 (LAE), *McAdam* 90 (A, BRI, NY), *Weatherhead* in *Swain* 346 (BRI), *Webb* 5013 (CANB). MORETON DISTRICT: Eumundi, *Bailey*, June 1893 (BRI, NSW 99588), *Simmonds*, June 1895 (A); Candle Mountain, *White*, May 5, 1918 (BRI); Moreton Bay, *Cunningham* (BM), *Hill* (K, MEL), *Leichhardt*, 1845 (P-holotype of *Flindersia leichhardtii* C. DC.); Brisbane, *Boorman*, April 1899 (MEL, NSW 99585), *White*, June 3, 1926 (A, BO, BRI); Mount Cotton, *Scortechini* (BRI, MEL); Tamborine Mountain, *Clemens*, March 1947 (BRI); Beech Mountain, *White* 1907 (A, BRI, NSW 99584); Southport, *Simmonds*, June 1913 (A, NY); Meyer's Ferry, Nerang River, *White*, October 20, 1917 (BRI, NSW 99583). Without definite locality: *Bennett* (NSW 99587). New South Wales. Tweed River, *Anonymous*, November 1897 (MEL); Tweed River District, *Grime*, July 1900 (NSW 99576); Cudgen, Murwillumbah District, *McKee* 9547 (BRI, CANB, NSW 99589); Hastings Point, *Trapnell*, June 7, 1960 (BRI); east foothills of Nightcap Range ca. 2–3 miles SW of Goonengerry, *Schodde & Hayes* 3561 (CANB, NSW 99572); Three Mile Scrub, near Byron Bay, *Forsyth*, November 1898 (NSW 99575); Whian Whian State Forest, *Jones* 937 (CANB), *Webb* 5242 (CANB); Richmond River, *Baeuerlen* 244 (MEL), *Boorman*, February 1899 (P), *Fawcett* (MEL), *Henderson* 22 (MEL), (BM, BO, MEL, NSW 99573), *Mrs. Hodgk* (MEL); Dalwood, Richmond River, *Graham* in *Watts* 37 (MEL, NSW 99579); Richmond and Clarence Districts, *Bennett* (MEL); Minyon Falls, N of Lismore, *de Beuzeville*, July 16, 1936 (NSW 99566); Dorrroughby, 14 miles NE of Lismore, *Byrnes*, September 1953 (NSW 99580); Wollongbar Experimental Farm, *Anonymous*, November 1897 (NSW 99570), *Manager Experimental Farm*, *Wollongbar* 6 (NSW 99577); Lismore, *Forest Guard*, March 1909 (NSW 99568), *Baeuerlen* 350 (A, NSW 99574), 698 (NSW 99581); Ballina, *Baeuerlen* 836 (MEL); 8 miles N of Woodburn, *Williams* J43 (NSW 99571); Clarence River, *Beckler* (MEL), *Wilcox*, 1875 (MEL); Iluka, *Cameron* 93 (NSW 99567). Cultivated. New South Wales. Sydney Botanic Gardens, *Boorman*, September 1919 (BRI, NSW 99578, US), *Camfield*, September 1896 (NY), February 1899 (NSW 99569, US), *Mueller* (NSW



99590); Sydney, Paddington, *Vernon*, March 11, 1879 (MEL). Victoria. Melbourne Botanic Gardens, *Anonymous*, October 23, 1934 (MEL).

There is apparently no authentic material of *Flindersia leichhardtii* in the Australian herbaria and it has not previously been placed in the synonymy of *F. bennettiana*.

As is indicated above, *Flindersia bennettiana*, *F. collina*, *F. dissosperma*, and *F. maculosa* comprise a group of related species. They appear to be related to one another in a linear sequence, beginning with a rain-forest species, *F. bennettiana*, and ending with a xerophyte, *F. maculosa*. The following outline shows the apparent relationships of these species as indicated by various morphologic features.

Trichomes stellate; leaves imparipinnate, 8.5–36(45) cm. long, the rachis not winged. . . . . 11. *F. bennettiana*.

Trichomes stellate and lepidote; leaves imparipinnate or trifoliolate, 5–14 cm. long, the rachis winged. . . . . 12. *F. collina*.

Trichomes predominantly lepidote; leaves predominantly trifoliolate, 1.5–6.3 cm. long, the rachis winged. . . . . 13. *F. dissosperma*.

Trichomes predominantly lepidote; leaves 1–9 cm. long, simple. . . . . 14. *F. maculosa*.

12. *Flindersia collina* F. M. Bailey, Queensl. Agr. Jour. 3: 354. 1898 (based on *Flindersia strzeleckiana* F. Muell. var. *latifolia* F. M. Bailey). Lectotype: *Bailey*, Queensland, Moreton District, Main Range.

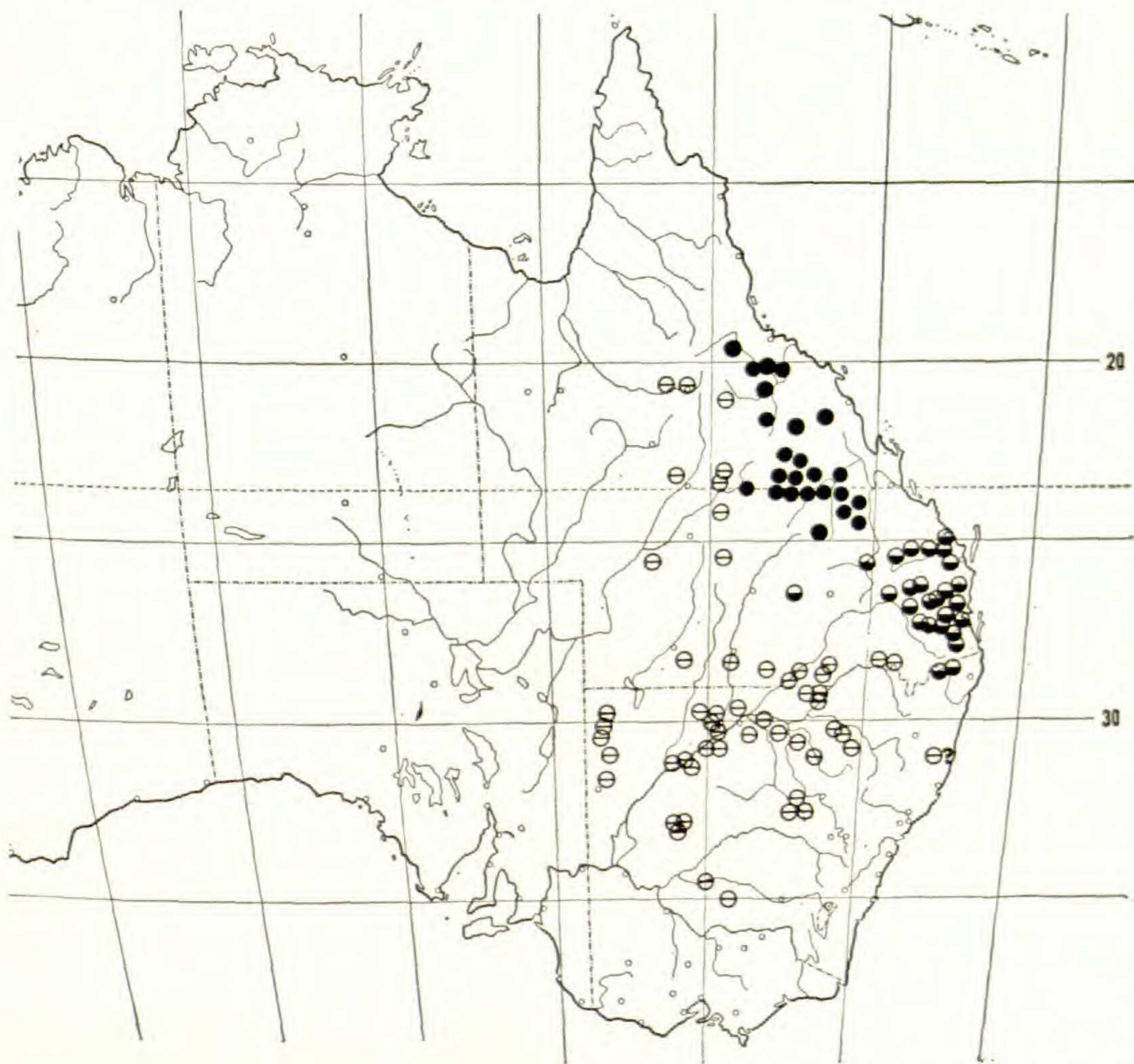
*Flindersia strzeleckiana* F. Muell. var. *latifolia* F. M. Bailey, Synop. Queensl. Fl. 1st suppl. 12. 1886.

Medium to large trees to 40 m.; outer bark mottled, green and brown, exfoliating in thin roundish flakes leaving shallow depressions; inner bark reddish grading to cream toward the cambium; sapwood yellow to yellow-brown; heartwood yellow to pale brown; branchlets, leaves, and inflorescences glabrous to lepidote or minutely pubescent with predominantly scale-like and stellate trichomes. Leaves opposite or subopposite, imparipinnate or trifoliolate, 5–14 cm. long; rachis glabrous to lepidote or appressed-pubescent below, glabrous or short-pubescent above, narrowly to broadly winged laterally, the wings extending 0.3–2.4(–4) mm. on each side; leaflets sessile, 1–2(–3) pairs, chartaceous to coriaceous, with scattered pellucid dots, glabrous or sparsely lepidote or appressed-pubescent below, glabrous above, elliptic to obovate to broadly spatulate, 2–9 cm. long, 1–4.7 cm. wide, base obtuse or (in some terminal leaflets) attenuate, veins prominent above, main veins (10–)12–16 on each side of the midrib, apex obtuse to rounded, usually retuse or emarginate. Inflorescence terminal or terminal and axillary, to 17 cm. long, generally about as wide as long, axes and branches glabrate to short-pubescent. Flowers bisexual or (a few to many flowers in an inflorescence) functionally staminate, 4.7–5.3



mm. long; pedicels 0.5–4.5 mm. long; sepals appressed-pubescent, ciliate, broadly ovate, about 1 mm. long; petals white, glabrate to appressed-pubescent abaxially, short-pubescent in the basal half adaxially, elliptic, 4–5 mm. long; stamens declinate, 3.5–4 mm. long, filaments glabrous, anthers subdorsifixed, subacute apically, about 1 mm. long; staminodes about 2 mm. long; disc about 0.75 mm. high; gynoecium in bisexual flowers about 1.75 mm. high, 1.25 mm. wide, ovules 2 on each side of the placentae; gynoecium in functionally staminate flowers poorly differentiated, conical, about 1 mm. high, without ovules. Capsule separating (or easily separable) at maturity into 5 distinct valves, elliptic to elliptic-oblong, 2.8–5 cm. long; exocarp drying dark brown, glabrous or glabrate, muricate, excrescences 1–2 mm. long; endocarp rather dark brown. Seeds 2 on each side of the dissepiments, winged at both ends, 1.5–2.5 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. FRANCIS, W. D., Australian Rain-forest Trees 170, 171. 1929; 188, 189. 1951. MAIDEN, J. H., Forest Fl. New S. Wales 3: t. 81 & 82. 1907.



MAP 6. Distributions of *Flindersia collina* F. M. Bailey (half-filled circles), *F. dissosperma* (F. Muell.) Domin (dots), and *F. maculosa* (Lindl.) Benth. (open circles with diameter line).



**DISTRIBUTION.** Southeast Queensland and adjacent New South Wales; rain forests and rather dry scrubs to 700 meters. See MAP 6.

**Queensland.** LEICHHARDT DISTRICT: Taroom, *Mobsby*, October 1912 (BRI). BURNETT DISTRICT: Eidsvold, *Bancroft*, April 1911 (BRI), April 1923 (A), April 1928 (NSW 99671); Goodnight Scrub, ca. 40 miles SW of Bundaberg, *Smith* 9882 (BRI); West Wooroolin, NW of Kingaroy, *Everist*, March 23, 1961 (BRI); Kingaroy, *Smith* 3115 (BRI, NY); Nanango, *Grove* 131 (BRI); Cooyar and Charlestown, Gympie Forest District, *Swain*, March 1917 (BRI); without definite locality (probably Mt. Perry *fide* L. S. Smith), *Keys*(?) 800 (BRI). WIDE BAY DISTRICT: Bundaberg, *Boorman*, July 1912 (NSW 96676); Kepnock, about 2 miles E of Bundaberg, *Smith* 4163 (BRI); Childers, *Helms*, January 3, 1899 (BRI), *Anonymous* (NSW 99670); Bauple, *Clemens*, June 10–20, 1945 (GH, MICH); near Imbil, *Smith & Webb* 3129 (BRI, CANB). MARANO DISTRICT: about 20 miles W of Mitchell, *Everist*, March 7, 1950 (BRI). DARLING DOWNS DISTRICT: Chinchilla, *Beasley* 52 (BRI); Bunga Mts., *White*, October 1919 (BRI); Rangemore School Area, Cooyar-Bunya Mountains Road, *Smith* 10260 (A, BRI, K, NSW 96677); Toowoomba, *Longman*, October 1910 (K, NSW 99675). MORETON DISTRICT: Parish of Monsidale, *Webb* SN 5422b (CANB); Yarraman, *Clemens*, August 1944 (A, BRI, NY, US), *Floyd*, August 28, 1949 (LAE), *Webb* SN 5338 (CANB); Kilcoy, *English*, October 1919 (A, BRI); Jimna, near Kilcoy, *Webb* 5248 (CANB); Crow's Nest, *Clemens* 43641 (A); Main Range, *Bailey* (BRI-lectotype of *Flindersia collina* F. M. Bailey), *Pentecost* 29 (BRI, NSW 99669); Flagstone Creek, ca. 8 miles SE of Toowoomba, 7 miles SW of Helidon, *Smith*, October 13, 1965 (BRI); Helidon, *White* 8765 (A); Fernvale, ca. 13 miles NW of Ipswich, *Bevington*, 1909 (BRI); Rosewood, *Anonymous*, October 1908 (BRI); Brisbane River, *Cunningham* 164 (BM), October 1828 (K, MEL); Moreton Bay, *Cunningham* 18 (BM, GH, NY), *Fraser* (K); Kelvin Grove, Brisbane, *White & Francis*, September 1920 (BRI); Marburg Range, western slopes, *Smith & Webb* 3700 (BRI); 1 mile N of Boonah on Kalbar Road, *Everist & Webb* 1413 (BRI). Without definite locality: *Bowman* (MEL), *Trist* 19 (NY). **New South Wales.** Acacia Creek, near Killarney, Queensland, *Boorman* 15 (NSW 99673), February 1905 (K), *Dunn*, September 1905 (MEL, NSW 99672), October 1905 (K), February 1906 (NSW 99674); Unumgar, *Jones* 2371 (CANB). Without definite locality. *Hill* 53 (MEL).

13. *Flindersia dissosperma* (F. Muell.) Domin, *Bibliot. Bot.* 22 (89): 298. 1927.

*Strzeleckya dissosperma* F. Muell. in Hooker's Jour. Bot. & Kew Gard. Misc. 9: 308. 1857. Type. *Mueller*, Queensland, Burdiken River.

*Flindersia strzeleckiana* F. Muell. *Frag. Phytogr. Austral.* 1: 65. 1859 (*nomen illegit.*, based on *Strzeleckya dissosperma* F. Muell.).

Small trees to 10 m., developing from a divaricately branched shrub stage; outer bark mottled, dark gray and white, cream or salmon, rough-scaly on the trunk, smooth above; inner bark reddish grading to cream toward the cambium; branchlets, leaves, and inflorescences glabrous to lepidote or minutely pubescent with scale-like and stellate trichomes. Leaves opposite, imparipinnate or trifoliolate, or (rare occasional leaves) simple, (0.8–)1.5–6.3 cm. long; rachis sparsely lepidote below, winged



laterally, the wings extending 0.5–1.5 mm. on each side; leaflets sessile, 1–2 pairs, chartaceous to subcoriaceous, with scattered pellucid dots, sparsely lepidote below, glabrous above, elliptic, spatulate, oblong or sublinear, 0.6–3.7 cm. long, 0.2–0.7 cm. wide, base obtuse, main veins usually indiscernible, 8–10 on each side of the midrib, apex rounded to acute, occasionally retuse. Inflorescence terminal or rarely terminal and upper-axillary, to 8 cm. long, usually nearly as wide as long, axes and branches sparsely to rather densely lepidote to appressed- or short-pubescent. Flowers bisexual or (a few to many or all of the flowers in an inflorescence) functionally staminate, 3–4 mm. long; pedicels 0.7–2 mm. long; sepals glabrous or glabrate, ciliate, suborbicular, 1–1.3 mm. long; petals white to cream, glabrous, broadly elliptic, 3–3.5 mm. long; stamens inflexed apically, about 2.5 mm. long, filaments glabrous, anthers subdorsifixed, bluntly mucronulate, about 1 mm. long; staminodes 0.5–1 mm. long; disc about 0.5 mm. high; gynoecium in bisexual flowers about 1.5 mm. high and 1 mm. wide, ovules 2 on each side of the placentae; gynoecium in functionally staminate flowers poorly differentiated, pulvinate, about 0.4 mm. high, without ovules. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic, 2–3 cm. long; exocarp drying dark reddish brown, glabrous, muricate, the excrescences 1–2 mm. long; endocarp brown. Seeds 2 on each side of the dissepiments, winged at both ends, 1.5–1.8 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATION. BAILEY, F. M., Comprehensive Cat. Queensl. Pl. t. 73. 1913 (as *Flindersia strzeleckiana*).

DISTRIBUTION. East central Queensland; dry scrubs to 300 meters. See MAP 6.

Queensland. NORTH KENNEDY DISTRICT: Maryvale Station, *Daintree* (MEL); W of Charters Towers, *Blake* 14906 (BRI); Charters Towers, *Michael* 1275 (BRI), *Stephens North Queensl. Nat. Club* 10468 (NSW 99689); Millchester Hill, *Stephens North Queensl. Nat. Club* 9056 (BRI); Burdiken, *Kennelly* 208 (CANB), *Mueller* (MEL-holotype of *Strzeleckya dissosperma* F. Muell.; K-isotype); Herbert's Creek, *Bowman* 70 (MEL); near Bogie Range, lower Burdekin River, ca. 42 miles S of Ayr, *Smith* 4532 (BRI); Cape River, *Daintree* (MEL), *Fitzalan* (MEL). SOUTH KENNEDY DISTRICT: Head of Suttor River, *Sutherland* (MEL); Laglan, about 80 miles W of Clermont, *Everist*, October 12, 1960 (BRI, K); 18 miles ENE of Surbiton Station, *Adams* 1317 (CANB). MITCHELL DISTRICT: Jericho, *Clemens*, March 13, 1946 (GH, MICH), May 1, 1946 (MICH), *Francis*, March 1920 (BRI). LEICHHARDT DISTRICT: Peak Downs, *Mueller* (MEL); 9 miles SW of Anakie, *Adams* 1281 (CANB, MEL, NSW 99685); E of Emerald, *Webb* 2251 (CANB); Emerald, *Webb* SN 5296 (CANB); Blair Athol, *Massey* 30 (BRI); ca. 3 miles N of Clermont on road to Charters Towers, *Smith* 3160 (BRI); Clermont, *Small*, September 1912 (BRI, K, NSW 99621); Chirnside, ca. 6 miles S of Capella, *Smith & Webb* 3428 (BRI); 2 miles N of Emerald, *Bisset* E198 (BRI); 4 miles E of Girrah Homestead, 36 miles N of Blackwater Township, *Lazarides & Story* 70 (K, NSW 99690, NY); Blackwater, *Anderson*, October 1967 (BRI); 7 miles N of Goowarra, *Anderson*, October 15, 1965 (BRI); about 3 miles E of Goowarra, *Johnson* 943 (A, BRI); 3 miles E of Parkes Homestead,



*Speck* 1672 (CANB, NSW 99686); Dingo, *O'Shanesy* 2013 (MEL); 8.5 miles SW of Duaringa, *Speck* 1820 (BRI, CANB, NSW 99687); near Duaringa, *Simmons*, May 1938 (BRI); between the Barcoo and Springsure, *Bailey* (MEL). Without definite locality: *Bailey* (BRI, NSW 99688), *Fitzalan* (MEL).

14. *Flindersia maculosa* (Lindl.) Benth. Fl. Austral. 1: 389. 1863.

*Elaeodendron maculosum* Lindl. in Mitchell Trop. Austral. 384. 1848. Type: Mitchell, November 1846, New South Wales, Balonne River.

*Flindersia maculata* F. Muell. Quart. Jour. Trans. Pharm. Soc. Victoria 2: 44. 1859 (*nomen illegit.*, based on *Elaeodendron maculosum* Lindl.).

Small to medium trees to 15 m., developing from a divaricately branched shrub stage; outer bark mottled, dark gray or brown and cream or white, smooth-scaly on the trunk, smooth above; wood yellow; branchlets, leaves and inflorescences glabrous to lepidote or minutely pubescent with scale-like and stellate trichomes. Leaves opposite, simple; petioles lepidote below, short-pubescent above, 1–12 mm. long; leaf blades chartaceous to subcoriaceous, with scattered pellucid dots, minutely and sparsely lepidote and appressed-pubescent below, glabrous or short-pubescent on the midrib above, narrowly elliptic-oblong, oblanceolate or sublinear, 1–8 cm. long, 0.25–1 cm. wide, base narrowly obtuse to attenuate, main veins usually indiscernible, 12–17 on each side of the midrib, apex rounded to obtuse, occasionally retuse. Inflorescence terminal or rarely terminal and upper-axillary, to 7.5 cm. long, usually about as wide as long, axes and branches sparsely to densely lepidote to appressed- or short-pubescent. Flowers bisexual, 4–4.5 mm. long; pedicels obsolete to 2.5 mm. long; sepals glabrous, ciliate, broadly ovate to orbicular, 1–1.5 mm. long; petals white to cream, glabrous, obovate, about 4 mm. long; stamens inflexed apically, about 3 mm. long, filaments glabrous, anthers subdorsifixed, obtuse to bluntly mucronulate, 1–1.2 mm. long; staminodes about 0.5 mm. long; disc about 0.75 mm. high; gynoecium about 1.5 mm. high and 1 mm. wide, ovules 2 on each side of the placentae. Capsule separating (or easily separable) into 5 distinct valves at maturity, elliptic, 2.3–2.7 cm. long; exocarp drying dark reddish brown, glabrous, muricate, the excrescences 1–1.5 mm. long; endocarp brown. Seeds 2 on each side of the dissepiments, winged at both ends, about 1.8 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. BAILEY, F. M., Comprehensive Cat. Queensl. Pl. t. 73 bis. 1913. MAIDEN, J. H., Forest Fl. New S. Wales 1: 213. t. 39. 1904.

DISTRIBUTION. Central Queensland south to southcentral New South Wales; dry, rather open places. See MAP 6.

Queensland. BURKE DISTRICT: 57 miles W of Hughenden, *McCray*, September 21, 1967 (BRI); Hughenden, *Brass & White* 63 (A, BO, BRI, K). MITCHELL DISTRICT: Tiree Station, about 68 miles S of Torrens Creek, *Ford*, September 28, 1949 (K, NSW 10258, US); Evesham, between Longreach & Winton, *Everist & White* 134 (BRI); Aramac, *Paulton* (MEL); Barcaldine, *Francis*,



March 1920 (BRI); between Emerald and Longreach, *Jarvis*, October 1913 (BRI); Blackall, *Bailey* (NSW 99620), *Everist* 1562 (A, BRI), *White* 12387 (A, K, US). GREGORY SOUTH DISTRICT: Thylungra, about 75 miles NW of Quilpie, *Everist* 5787 (BRI). WARREGO DISTRICT: about 19 miles N of Thargomindah, *Smith* 6346 (BRI); about 34 miles N of Charleville on Ward River Road, *Smith* 841 (A, BRI, K, MEL, NY); between Cunnamulla and Wyandra, *Key*, October 1940 (CANB); near Cunnamulla, *White* 11782 (BRI). MARANOA DISTRICT: Maranoa, *Anonymous* (MEL); Bollon Area, *Epps*, June 26, 1953 (BRI); 10 miles N of Dirranbandi, *Key*, October 17, 1937 (CANB); Buckinbah, near St. George, *Jones* 215 (BRI); St. George, *Wedd*, December 1893 (BRI); Nindigully District, *Anonymous*, November 1938 (CANB); Warrie, Nindigully, *Allen* A547 (CANB), *Roe* R10 (CANB), October 1937 (CANB). DARLING DOWNS DISTRICT: 36 miles W of Goondiwindi on Talwood Road, *Webb* SN 5319a (CANB), SN 5319b (CANB), SN 5319c (CANB), SN 5319d (CANB); Goondiwindi District, *Jones* C50 (CANB), *Webb* 1611 (CANB), 2498 (CANB). **New South Wales.** Yantara Lake, *Anonymous* 385 (MEL); E of Broken Hill, *Pidgeon & Vickery*, August 1939 (NSW 99617); Koonenberry Mountains, ca. 62 miles SSE of Milparinka, *Constable* 4609 (NSW 64979), *V. E. Expedition* (MEL); Mount Hope Station, 3 miles N of White Cliffs, *Constable* 4595 (NSW 67368); Wonominta River, *Kennedy*, January 1887 (MEL); Wilcannia, *Johnson* 547/90 (NSW 5181), *Kennedy*, 1886 (MEL); about 12 miles S of Wilcannia, *Hogan*, October 1955 (MEL); between Wilcannia and Cobar, *Campbell* 109 (CANB); 30 miles E of Wilcannia, *Riek & Common* 322 (CANB); above Morinda (Menindee) and Mt. Murchinson (Murchiston), *Anonymous* (MEL); Menindee District, Neila-garri Station, *Constable*, November 20, 1947 (NSW 4879); Mt. Murchinson, *Anonymous* (MEL), *Dallachy* (BM, GH, K, NY), *Dallachy & Goodwin* (MEL); Darling River, *Anonymous* (MEL), *Dallachy* (BM), *Kennedy*, 1866 (MEL); about 1 mile E of Ivanhoe, *Johnson*, May 6, 1955 (NSW 99615); Mossgiel, *Bruckner*, October 1885 (MEL), *Mueller* (GH); between the Lachlan River and Darling River, *Bruckner*, 1885 (MEL), *Mueller* (P); Lachlan River, *Tucker* (MEL); Upper Lachlan River, *Curran* 21 (MEL); 11 miles from Ivanhoe on Paddington Road, *Whaite* 1388 (NSW 99616); between Kirriby and Lauradale, Warego River to Paroo River, *Boorman*, October 1912 (BRI, NSW 99619, US); near Morton Boolka, *Morris* 766 (NSW 99618); Barrington, *Foyster*, 1884 (MEL); Bourke, *Betche*, November 1887 (NSW 99623), *McDougall*, 1901 (NSW 99613), *Wuerfel*, 1884 (MEL); Clover Creek, Bourke, *Mackay* 112 (MEL); 20 miles SE of Bourke, *Riek & Common* 132 (CANB); 40 miles S of Bourke, *Leigh*, ca. November 1967 (NSW 99632); Dunlop Station, ca. 8 miles S of Louth, *Etheridge* 28 (NSW 99622); Cobar, 4 mile, Wilcannia Road, *Forestry Officer* 24 (NSW 99629); between the Bogan and Darling Rivers, *Morton* 77 (MEL); Bogan River, *Anonymous* (MEL); Bogan, *Morton*, 1880 (MEL); W of Nevertire, *Clarke*, June 14, 1944 (CANB); Castlereagh River, *Anonymous* 8 (MEL); 40 to 50 miles NW of Collarenebri, *Jackson*, October 1911 (NSW 99628); Balonne River, St. George's Bridge (ca. 25 miles W of Mungindi), *Mitchell*, November 1846 (K-holotype of *Elaeodendron maculosum* Lindl.; NSW 99612-isotype); Brewarrina, *Boorman*, November 1903 (GH, NSW 99630, NY, US); Yarrawin Station, Barwon River, 30 miles SE of Brewarrina, *Froggatt* 16 (NSW 99627); Carinda, ca. 40 miles SW of Walgett, *Bucknell & Lowe*, August 1965 (NSW 99631); Pilliga, *Rupp* 13 (NSW 99625); Pilliga Scrub, *Anonymous*, November 1932 (MEL); between Pilliga and Wee Waa, *Bassett*, November 14, 1947 (NSW 99626); plains near Baradine, *Forsyth*, October 1899 (NSW 99624); Ellenborough Falls(?), *Boorman*, 1904 (A, P, US); Murrumbidgee River, *Bennett* 3 (MEL); Cobar to Riverina Dis-



tracts, *Anonymous* (MEL); Riverina, *Morton*, 1880 (MEL). Without definite locality. *Bidwill* 74 (K), *Anonymous* (NSW 99614).

15. *Flindersia ifflaiana* F. Muell. Frag. Phytogr. Austral. 10: 94. 1877.  
Type: *Hill*, Queensland, Trinity Bay.

*Flindersia brachycarpa* Merr. & Perry, Jour. Arnold Arb. 20: 332. 1939. Type:  
*Brass* 8389, Papua, Wassi Kussa River.

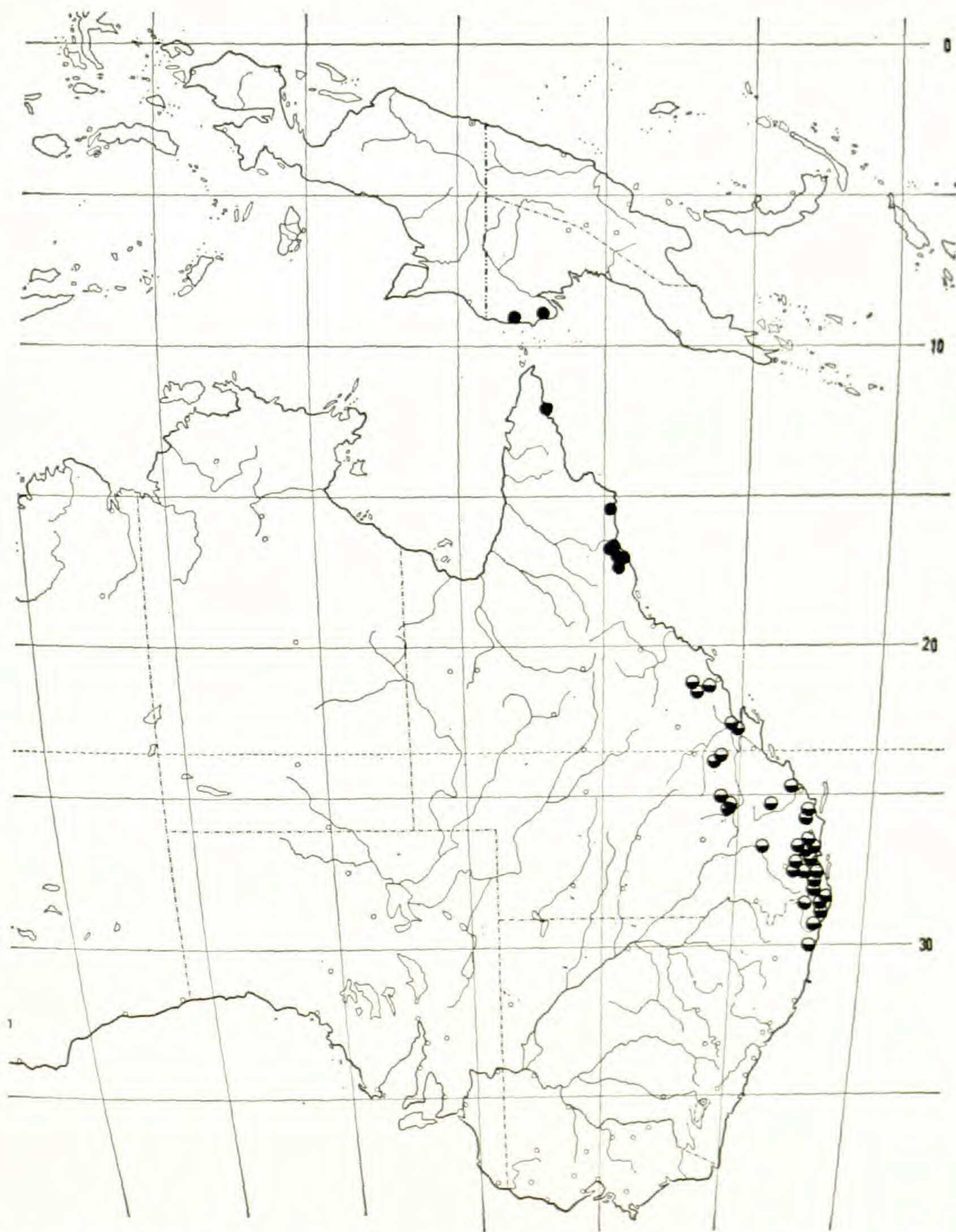
Medium trees to 35 m.; outer bark gray-brown, thick, deeply longitudinally fissured; inner bark red, grading to cream toward the cambium; sapwood yellow or yellow-brown; heartwood yellow-brown or brown; branchlets, inflorescences, and capsules glabrous to pubescent with mostly minute, predominantly stellate trichomes. Leaves opposite, paripinnate, 15–34 cm. long; rachis glabrous; petiolules 4–9 mm. long; leaflets 3–6 pairs, chartaceous to subcoriaceous, densely pellucid-dotted, glabrous, ovate-elliptic, elliptic, elliptic-lanceolate, or occasionally lanceolate, usually unequal-sided and often subfalcate, 6–13.5 cm. long, 2.8–5.2 cm. wide, base rounded to subcuneate, often slightly oblique, main veins 14–22 on each side of the midrib, apex rounded to narrowly obtuse, rarely subacuminate. Inflorescence terminal or terminal and upper-axillary, 14–25 cm. long, usually as wide as long or somewhat wider, axes and branches glabrate to appressed- or short-pubescent. Flowers bisexual or (a few to many flowers in an inflorescence) functionally staminate, 2.5–3 mm. long; pedicels 0.5–2.5 mm. long; sepals sparsely appressed-pubescent, ciliolate, ovate-triangular, 1–1.2 mm. long; petals white, sparsely appressed-pubescent abaxially, glabrous or with a few papillae adaxially, elliptic to elliptic-oblong, 2–2.5 mm. long; stamens inflexed apically, about 1 mm. long, filaments glabrous, anthers subdorsifixed, bluntly mucronulate, about 0.5 mm. long; staminodes 0.5 mm. long; disc about 0.7 mm. high; gynoecium in bisexual flowers about 1.5 mm. high, about 1 mm. wide, ovules 2 on each side of the placentae; gynoecium in functionally staminate flowers poorly differentiated, turbinate, about 0.5 mm. high, without ovules. Capsule comparatively woody and heavy, separating to one-half or more of the length but not completely, rounded short-cylindric, 3.2–5.5 cm. long; exocarp drying blackish brown to reddish brown, densely and minutely pubescent, often cracked with age, muricate, the excrescences rather widely spaced, to 2 mm. long; endocarp reddish brown. Seeds 2 on each side of the dissepiments, winged at the apical end only, 2.7–3.3 cm. long; hypocotyl lateral, ascending.

ILLUSTRATION. FRANCIS, W. D., Australian Rain-forest Trees 426. 1951.

DISTRIBUTION. Southern Papua south to the Atherton Tableland, Queensland; rain forests to 400 meters. See MAP 7.

Papua. WESTERN DISTRICT: Tarara, Wassi Kussa River, *Brass* 8389 (A-holotype of *Flindersia brachycarpa* Merr. & Perry; BRI, L, LAE-isotypes); Oriomo Creek, mouth of Yakup Creek, 40 miles from sea, *Womersley* NGF 17728 (A,





MAP 7. Distributions of *Flindersia iflaiana* F. Muell. (dots) and *F. australis* R. Br. (half-filled circles).

BO, K, L, LAE, NSW 99667). **Queensland.** COOK DISTRICT: Cape York Peninsula, Cape Grenville, *Young* 64 (BRI); Endeavour River, *Parsieh*(?) (MEL); mountains near Mossman, *Rosenstrom* (BRI); Great Dividing Range ca. 6 miles S of Mossman, *Smith* 3964 (BRI); Mt. Molloy, *Crothers*, 1934 (A, BO, BRI, NY); Barron River, *Anonymous* 46 (MEL); Forestry Reserve 1073, N of Kuranda, *Dansie* 1995 (BRI, K), 1996 (BRI), 2008 (BRI); Timber Reserve 315, Smithfield, Kuranda, *Doggrell* A36 (BRI); Black Mountain near Kuranda, *Jones* 800 (CANB), 1511 (CANB), *Webb* 5189 (CANB); a few miles N of Kuranda, *Smith*



5309 (BRI); Trinity Bay, Hill (MEL-holotype of *Flindersia ifflaiana* F. Muell.; K-isotype); Cairns, Bailey (NSW 99684); Freshwater Creek, Bailey (BRI); Kamerunga, Cowley 43 (BRI); Edge Hill, near Cairns, Morris North Queensl. Nat. Club 4084 (BRI); Redlynch, near Cairns, White 12813 (A, NY); Atherton Area, Webb 2547 (CANB), 5208 (CANB). Without definite locality: *Anonymous* 10 (BRI), *Wood Technology Dept. Queensland Forest Service* 91 (A, NY). Cultivated. Queensland: COOK DISTRICT, Cairns, on esplanade, White, February 1918 (BRI).

In the original description of *Flindersia brachycarpa*, Merrill and Perry stated that it strongly resembled *F. ifflaiana* but differed “. . . . in having larger leaves with the leaflets strongly oblique at the base and more acute at the apex, and a little larger fruits.” These have proven to be quite variable characters in many species of *Flindersia* and now, with additional collections available, it is evident that they do not serve to distinguish *F. brachycarpa* from *F. ifflaiana*.

As is pointed out above, *Flindersia ifflaiana* is apparently more closely related to *F. australis* than to any of the other species of the genus. The two do not appear to be particularly closely related, however. The leaves of *F. ifflaiana* are opposite and paripinnate whereas those of *F. australis* are usually alternate and basically imparipinnate. Additional differences are given in the key to species.

16. *Flindersia australis* R. Br. in Flinders' Voyage 2: 595. t. 1. 1814.

Type: *Brown*, September, 1802, Queensland, Broad Sound.

Medium trees to 25 m.; outer bark gray to brown, smooth or with shallow longitudinal fissures, often exfoliating in flakes; inner bark reddish; branchlets, leaves, inflorescences, and capsules glabrous to pubescent with mostly minute, predominantly stellate trichomes. Leaves alternate, subopposite or opposite, in mature growth closely crowded at the branchlet apices, imparipinnate or (occasional leaves) paripinnate, (5.5–)9–34 cm. long; rachis glabrous to densely appressed-pubescent, near the base often narrowly crisped-winged laterally; petiolules of lateral leaflets obsolete to 3(–5) mm. long, terminal leaflet sessile or on an extension of the rachis to 3.2 cm. long; leaflets 2–4(–6) pairs, chartaceous to subcoriaceous, with scattered pellucid dots, glabrous to densely appressed-pubescent below, glabrous or sparsely short-pubescent on the midrib above, broadly to narrowly elliptic to occasionally lanceolate, equal- or slightly unequal-sided, (2.4–)3–12 cm. long, (0.8–)1.5–4.3 cm. wide, bases of lateral leaflets obtuse to cuneate, base of terminal leaflet obtuse to attenuate, main veins 8–18 on each side of the midrib, apex obtuse to acute or subacuminate, occasionally rounded. Inflorescence terminal or terminal and upper-axillary, often on leafless branchlets, to 15 cm. long, about as wide as long, axes and branches rather sparsely to densely pubescent. Flowers bisexual or (a few to many flowers in an inflorescence) functionally staminate, 6.5–7.5 mm. long; pedicels 0.2–1 mm. long; sepals densely appressed-pubescent, irregularly ciliate, ovate-triangular, 2.2–2.5 mm. long; petals



white to cream, densely appressed-pubescent (except for the margins) abaxially, sparsely short-pubescent in the basal one-half to two-thirds adaxially, elliptic-oblong, 6–7 mm. long; stamens declinate, 3.5–4.5 mm. long, filaments glabrous or with a few papillae and/or crisped trichomes subapically, anthers subdorsifixed, mucronate, 1–1.3 mm. long; staminodes 1.5 mm. long; disc in bisexual flowers rather thin, about 1.5 mm. high; disc in functionally staminate flowers comparatively thick, about 1 mm. high; gynoecium in bisexual flowers about 3 mm. high, and 1.4 mm. wide, ovules 2 on each side of the placentae; gynoecium in functionally staminate flowers poorly differentiated, conical, about 0.6 mm. high, without ovules. Capsule comparatively woody and heavy, separating to one-half or more of its length but not completely, rounded short-cylindric, 4.6–9 cm. long; surface of exocarp drying blackish, reddish brown, or pale brown, densely and minutely pubescent, muricate, the excrescences rather densely crowded, often recurved, to 10 mm. long; inner part of exocarp very rough where exposed by dehiscence; endocarp cream, yellowish, or pale brown. Seeds 2 on each side of the dissepiments, winged at the apical end only, 3.4–5 cm. long; hypocotyl lateral, horizontal.

ILLUSTRATIONS. BROWN, R., *ibid.* FRANCIS, W. D., Australian Rain-forest Trees 158, 159. 1929; 176, 177. 1951. MAIDEN, J. H., Forest Fl. New S. Wales 2: t. 67 & 68. 1905.

DISTRIBUTION. Eastcentral Queensland south to northeastern New South Wales; rain forests and rather dry thickets. See MAP 7.

Queensland. SOUTH KENNEDY DISTRICT: Pinevale via Mackay, *Webb & Tracey* 3319 (BRI). LEICHHARDT DISTRICT: Lake Elphinstone, *Dietrich* (MEL); Morambah Homestead, 43 miles SW of Nebo Township, *Story & Yapp* 121 (BRI, K, MEL); 4.6 miles SW of Duaringa, *Speck* 1670 (CANB); Coomooboolaroo, *Berney* 1919 (BRI); Expedition Range, *Byerly* (MEL); 36 miles WSW of Theodore Township, *Lazarides* 6928 (BRI, K); 18 miles N of Taroom, *Speck* 1861 (BRI, CANB, K). PORT CURTIS DISTRICT: Broad Sound, *Brown*, September 1802 (K-holotype; BM, MEL, P-isotypes); near Ogmoo, ca. 75 miles NW of Rockhampton, *Smith*, October 18, 1951 (BRI); Rockhampton, *Thozet* (MEL). BURNETT DISTRICT: Eidsvold, *Bancroft*, April 1912 (BRI). WIDE BAY DISTRICT: Kolan River, *Smith's* Crossing, ca. 14 miles WNW of Bundaberg, *Smith* 4159 (BRI); Maryborough, *Clemens*, October 27, 1948 (BRI, GH, MICH); Mt. Bauple, *Clemens*, June 10–20, 1945 (MICH); Imbil, *McAdam* 84 (A, BRI); Cooroy, *Douglas*, November 2, 1962 (BRI). DARLING DOWNS DISTRICT: Chinchilla, *Beasley* 51 (BRI). MORETON DISTRICT: Yarraman, *Floyd*, August 29, 1949 (LAE); Coal Creek, *Shirley* (BRI); Parish of Monsidale, *Webb* SN 5422a (CANB); Jimna via Kilcoy, *Webb* 5247 (CANB); Main Range, *Pentecost* 26 (BRI); Rosewood, *Marquis* (BRI); North Pine River, at Draper's Crossing, *White* 8696 (A, BRI); Samford, *Meebold* 7999 (NY); Brisbane River, *Cunningham* 60 (K), *Mueller*, July, 1855 (MEL), *White*, November 1917 (BRI, NSW 99565); Cedar Creek, near Brisbane, *White* 1942 (A); near Brisbane, *Bailey* (NSW 99561); Albert River, W of Mt. Stapylton, ca. 21 miles SE of Brisbane, *Smith* 5151 (BRI); Logan River at Mt. Stapylton, *Wilson* 635 (BRI, US); Mt. Tamborine, *Clemens*, March 1947 (GH). Without definite locality: *Hill* 12 (K). New South Wales. New England,



*Law* (MEL); Unumgar, *Jones* 2367 (CANB); Murwillumbah, *Charles* 458.04 (NSW 99562); Whian Whian State Forest, *Webb & Tracey* 378 (CANB), 1953–1958 (BRI); Rous, near Lismore, *Cheel*, September 1926 (NSW 99560); Richmond River, *Cameron* (MEL), *Fawcett* (MEL), *Henderson* (MEL), *Hodgkinson* (MEL); Clarence River, *Moore* (MEL), *Beckler* (MEL); Kempsey, *MacDonald*, October 3, 1895 (MEL). Cultivated. **Queensland:** Brisbane Botanic Gardens, *Bailey*, November 11, 1884 (BRI), *Blake* 2797 (BRI), *Hubbard* 4745 (K), *White* 2442 (K). **New South Wales:** Sydney Botanic Gardens, *Boorman*, October 1920 (NY, US), November 1920 (NSW 99563).

### EXCLUDED NAMES

*FLINDERSIA GREAVESII* C. Moore, Cat. Nat. Industr. Prod. New S. Wales 53. 1861.

This name appeared in the "indigenous woods" section of a catalogue that accompanied an exhibit. Several other timber species were listed, each represented, apparently, by a wood sample. The description follows:

A magnificent tree, the monarch of the northern forests, attaining a height of 150 feet, 3 to 6 feet in diameter, distinguishable from every other species of the genus by its dark brown and rough scaly bark, as well as by other characters; timber used for house building purposes. Mountain brushes on the Clarence [River, New South Wales].

The wood sample has apparently been lost, but an herbarium specimen at Sydney (NSW 99604), labelled *Flindersia greavesii* by Moore and bearing the number 63, which corresponds to the number of that species in the catalogue, could be designated as the type collection.

The only really diagnostic statement in Moore's description is that pertaining to the bark, which would almost certainly apply to *Flindersia australis*. The specimen mentioned above, however, clearly matches *F. schottiana* (published a year later), a species with relatively smooth bark.

Maiden (Forest Fl. New S. Wales 2: 152. 1905) listed *Flindersia greavesii* as a synonym of *F. australis* and also designated it as a *nomen nudum*. He concluded, as I have, that the description referred to *F. australis* and that the type collection referred to *F. schottiana*. In addition, he pointed out that a tree in the Sydney Botanic Gardens, labelled by Moore as *F. greavesii*, is really *F. australis* and that Mr. W. A. B. Greaves, after whom the tree was named, gave him a fruit which he stated was that of *F. greavesii* and that it actually was *F. australis*.

Moore must have realized his error, too, since he did not mention *Flindersia greavesii* in his *Census of the plants of New South Wales* (1884) or in his *Handbook of the flora of New South Wales* (1893). *Flindersia australis* and *F. schottiana* were both mentioned in these publications.

Although I do not think *Flindersia greavesii* can be discounted as a *nomen nudum*, I think this name should be excluded since the description and the type collection clearly refer to two different species.



FLINDERSIA PAPUANA F. Muell. Descript. Notes Papuan Pl. 1(5): 84. 1877. Type: *D'Albertis*, Fly River, Papua (not seen).

Mueller named this species from a single immature fruit and stated that it was "... just a temporary name for the Papuan plant to place it on the record until foliage and flowers can be obtained." Thus it is a provisional name and is not validly published.

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- Kostermans 321, 337, 348, 481 (6)
- Lane-Poole 362 (6); 382 (4)
- Lazarides 6928 (16)
- Lazarides & Story 70 (13)
- Ledermann 9825 (4); 10406 (6)
- MacDonald 183, 212 (8)
- Mackay 112 (14)
- Malessij *NIFS* *bb* 14381 (2b)
- Manager Experimental Farm, Wollongbar 6 (7)
- Manuell 31 (9)
- Martin & Hyland 1881 (5)
- Massey 30 (13)
- McAdam 83 (10); 84 (16); 85, 87 (10); 90 (11); 291 (4)
- McAuliffe 8338/12 (8)
- McDonald *NGF* 8226 (6); *NGF* 13012 (2b)
- McKee 9547 (11)
- McViegh & Ridgwell *NGF* 7337 (6)
- Meebold 7999 (16)
- Michael 132 (9); 403 (7); 1275 (13); 3106 (10)
- Millar *NGF* 14516 (4)
- Moll, *BW* 9531 (8); *BW* 9552, *BW* 9571, *BW* 9657, *BW* 9745 (4); *BW* 11623 (6)
- Moore, C., 14125 (10)
- Moore, W. E., in Swain 337 (8)
- Morris, A., 766 (14)
- Morris, F. R., *North Qld. Nat. Club* 4084 (15)
- Morton 77 (14)
- New Guinea Forestry Department (*NGF*), the following by anonymous collector: 2063 (6)
- Netherlands Indies Forest Service (*NIFS*), the following by anonymous collectors: *bb* 15459, *bb* 22301 (2b); *bb* 24346, *bb* 25298, *bb* 25322, *bb* 25443, *bb* 25869, *bb* 30424 (6); *bb* 30466, *bb* 30526 (4); *bb* 32680 (6)
- Northern Woods New South Wales 24, 61 (8)
- O'Shanesy 2013 (13)
- Pedley 1060 (8)
- Pentecost 26 (16); 29 (12)
- van Petersen *BW* 2419 (4)
- Petrie 30 (11); 31 (8)
- Pleyte 703, 737 (8)
- Pullen 1882, 5584 (6); 6263, 6358 (4); 6383 (8); 6387 (4)
- Ridsdale *NGF* 31636 (2b)
- Riek & Common 0132, 0322 (14)
- Robbins 2612 (8)
- Roe *R10* (14)
- Ross *NGF* *W1001* (4)
- van Royen 3399 (2b); 3406 (8); 3505, 5165 (6); *NGF* 16302 (4)
- Rupp 13 (14)
- Saunders 894 (4); 975, 1079 (6)
- Sayer 136 (5)
- Schodde 2496, 2806 (6); 2862 (2b); 3326 (9)
- Schodde & Hayes 3561 (11)
- Schram *BW* 479, *BW* 1678 (6); *BW* 1752, *BW* 1756 (8); *BW* 1813, *BW* 1846 (6); *BW* 7607 (8); *BW* 7615, *BW* 7805 (6); *BW* 7921 (8); *BW* 10517 (4); *BW* 12354 (8)



- Simmons 4 (8)  
 Smith, L. S., 841 (14); *NGF* 1075 (4); *NGF* 1392 (2b); 3115 (12); 3160 (13); 3205 (9); 3780 (4); 3781 (8); 3824 (3); 3953 (4); 3964 (15); 4100, 4101, 4125 (8); 4159 (16); 4163 (12); 4532 (13); 4588X (4); 5151 (16); 5285 (3); 5309 (15); 6346 (14); 9882 (12); 10121, 10144, 10155 (7); 10260 (12); 10424 (7); 10824 (8); 11566 (9)  
 Smith, L. S., & Mair *NGF* 1253 (6)  
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 Tetelepta *NIFS bb* 14523 (2b)  
 Tracey 2192 (2a)  
 Tracey in Webb & Tracey 3392 (10)  
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 Womersley *NGF* 3192, *NGF* 3391 (4); *NGF* 17728 (15); *NGF* 17729 (8); *NGF* 19063 (4)  
 Womersley & Barrett *NGF* 4184 (2b)  
 Womersley & Brass *NGF* 11025 (4)  
 Womersley & Floyd *NGF* 6132 (4)  
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## A STUDY OF THE GENUS JOINVILLEA (FLAGELLARIACEAE) \*

THOMAS K. NEWELL

THE SMALL FAMILY Flagellariaceae is composed of perennial herbs distributed throughout the tropics and subtropics of the Old World. The type genus of the family, *Flagellaria*, includes four species (Backer, 1951), and is easily distinguished from *Joinvillea* by its circinate leaf tip which acts as a tendril, its climbing habit, and its non-plicate leaves. The genus *Joinvillea* includes seven described species which have often been reduced to four (Backer, 1951; Christophersen, 1935).

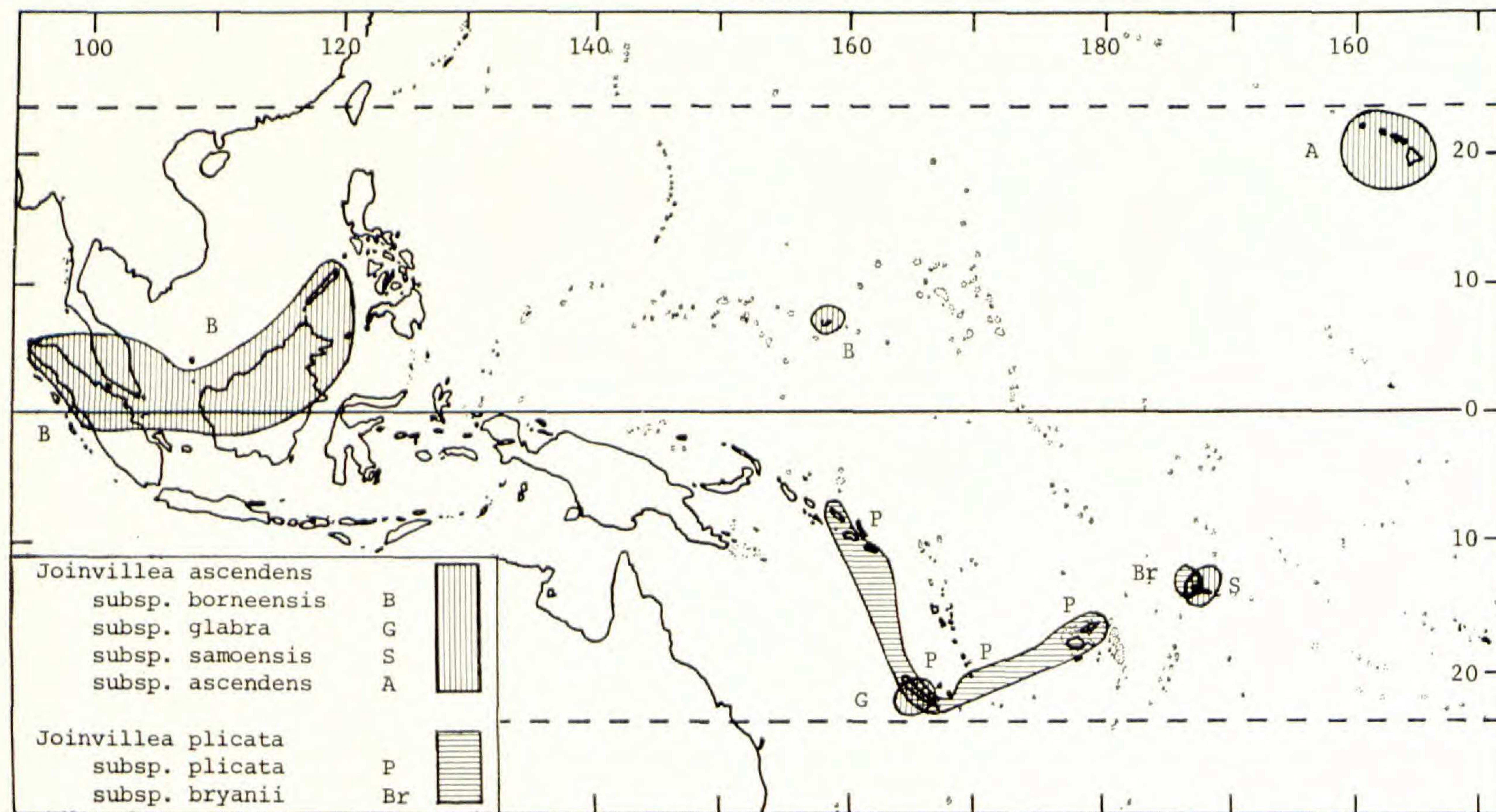
Until recently the family was also treated as including a third genus, *Hanguana* (Susum), which has now been assigned to its own family, the Hanguanaceae (Airy Shaw, 1965). *Hanguana* differs from the genera of the Flagellariaceae in having pollen provided with a spinulose exine (Erdtman, 1952), and in having different structure of the guard cells, the subsidiary cells, and the subhypodermal chlorenchyma (Smithson, 1956). Macroscopically, *Hanguana* differs in being dioecious and by its petiolate leaves.

The genus *Joinvillea* is distributed from West Malaysia to Samoa and as far north as the Hawaiian Islands. It is reported to occur in the Malay Peninsula (West Malaysia), Sumatra, Borneo (Sabah and Sarawak in East Malaysia and Kalimantan), the Philippine Islands (Jolo and Palawan), the Caroline Islands (Ponape), the Solomon Islands (Santa Ysabel, Guadalcanal, and San Cristóbal), New Caledonia proper and the Île des Pins, New Hebrides (Aneityum), Fiji (Viti Levu, Vanua Levu, and Taveuni), Western Samoa (Savaii and Upolu), and the Hawaiian Islands (Kauai, Oahu, Molokai, Maui, and Hawaii). The apparently discontinuous distribution of the genus, indicated by its absence from eastern Indonesia, New Guinea, and northern Australia, may be due to inadequate collection, while future collections may show the genus occurring in one or all of these areas. The distribution map (FIG. 1) shows the ranges of the species and subspecies of *Joinvillea*, according to my definition of the genus.

Taxonomically, *Joinvillea* has been studied mainly on a local basis, previous workers having confined their interest to relatively small geographic regions. A study of the genus as a whole has not previously been undertaken. Some species descriptions do not distinguish the taxa from one another, and type specimens have not always been designated. Fortunately, information concerning collectors, collection dates, and localities has, in most cases, allowed me to select lectotypes.

\* This paper is part of a thesis submitted to the Graduate School of the University of Hawaii in partial fulfillment of the requirements for the Master's degree.



FIG. 1. Distribution of the species and subspecies of *Joinvillea*.